Consulting Engineer

JULY, 1958

CHARLES C. PATE, newly elected president of the Consulting Engineers Council, has had an outstanding engineering career. Born in Raytown, Missouri (near Kansas City) in 1900, he received a B.S. degree in Civil Engineering from the University of Missouri in 1923. After graduation he

Continued on page 8

POWELL

world's largest family of valves

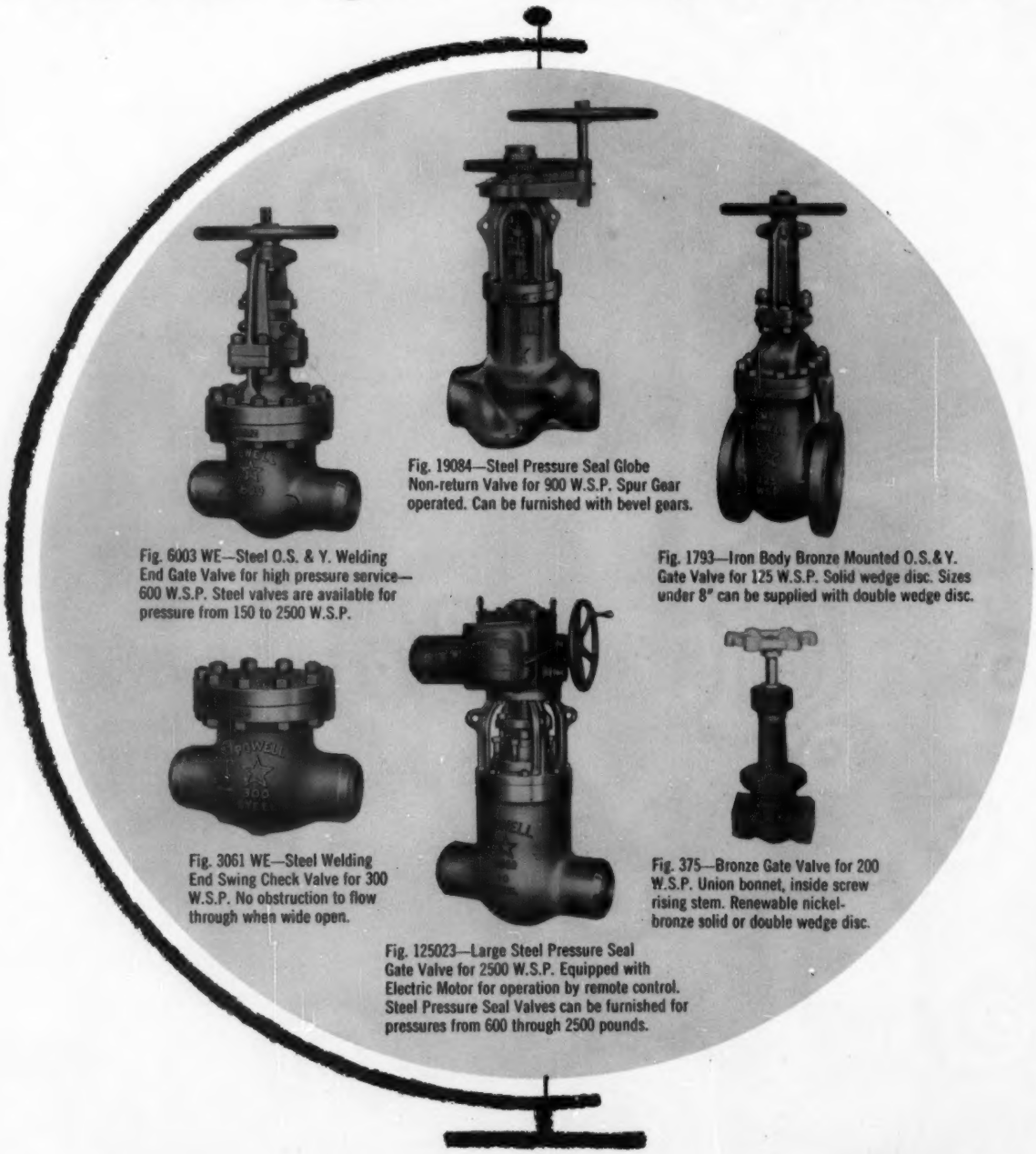

Fig. 19084—Steel Pressure Seal Globe Non-return Valve for 900 W.S.P. Spur Gear operated. Can be furnished with bevel gears.

Fig. 6003 WE—Steel O.S. & Y. Welding End Gate Valve for high pressure service—600 W.S.P. Steel valves are available for pressure from 150 to 2500 W.S.P.

Fig. 1793—Iron Body Bronze Mounted O.S.&Y. Gate Valve for 125 W.S.P. Solid wedge disc. Sizes under 8" can be supplied with double wedge disc.

Fig. 3061 WE—Steel Welding End Swing Check Valve for 300 W.S.P. No obstruction to flow through when wide open.

Fig. 375—Bronze Gate Valve for 200 W.S.P. Union bonnet, inside screw rising stem. Renewable nickel-bronze solid or double wedge disc.

Fig. 125023—Large Steel Pressure Seal Gate Valve for 2500 W.S.P. Equipped with Electric Motor for operation by remote control. Steel Pressure Seal Valves can be furnished for pressures from 600 through 2500 pounds.

FOR EVERY FLOW CONTROL PROBLEM Powell offers more kinds or types of valves, available in the largest variety of metals and alloys, to handle every flow control requirement. Your local valve distributor will be glad to tell you all about them. Or write to us for the full facts.

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Malan Construction Corp. of New York City as prime contractor, is building for the Atomic Energy Commission the Nation's first medical research center containing a nuclear reactor designed specifically for medical research and therapy. The entire medical center, including the reactor, is scheduled for completion in 1958 at a cost of approximately $6,000,000.

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PURIFICATION OF CONDENSATE WITHIN THE CYCLE

THE MODERN METHOD OF:

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- ✲ Increasing thermal efficiency
- ✲ Eliminating dissolved and suspended solids within the cycle
- ✲ Reducing the number of outages

As every power engineer knows, boiler and turbine outage is one of the most expensive operating costs for high pressure power plants in central stations. A major cause of shutdown -- as well as of reduced thermal efficiency -- is contamination of condensate and steam within the boiler-turbine cycle from such sources of solids as condenser leakage, fly ash, pre-boiler metallic corrosion and makeup solids.

Now...Internal Self-Purification of Condensate by Graver's "Kidney" Scavenging System can eliminate virtually <u>all contamination within the cycle!</u> This system consists of a high rate filter-mixed-bed demineralizer-filter combination that purifies condensate to <u>parts per billion,</u> instead of the usual parts per million...prevents build-up of corrosive products in the boiler and turbine cycles...considerably increases steam purity and, thereby, over-all cycle thermal efficiency. Thus, outages due to contamination can be eliminated and the need for blowdown, turbine washing and general all-around maintenance can be greatly reduced.

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Consulting Engineer ®

The Consulting Engineer's Professional Magazine

Wayne near Pleasant Street
Saint Joseph, Michigan

July 1958 • VOLUME XI • NUMBER I

ARTICLES

82 Teaching the Schools About Consultants
John C. Hitt

85 Shopping Centers . . . A Series of Project Studies
With Introduction by *Richard H. Tatlow III*

108 A New Approach to Stack Sizing
Paul R. Lutz

116 Consulting Engineers Council Invited to Join FIDIC
Edward J. Wolff

122 Dealing With the Architect Client
Staff

132 Canadian Consultants Complain of U. S. Competition
Staff

138 Report From Africa
Peter Holz

DEPARTMENTS

Cover Personality — Charles C. Pate
14 Readers' Comment
26 Readers' Guide
32 The Word from Washington
34 Scraps and Shavings
37 Legal Aspect
44 Report From the West Coast
64 Heard Around Headquarters
74 Atoms in Action
127 Krick Weather Forecast
146 Beyond Our Borders
167 News for the Consultant
180 Men in Engineering
186 New Projects Reported
198 Books
206 Meetings
208 Advertisers' Index

The Engineering Index Service in Public Libraries lists articles from Consulting Engineer

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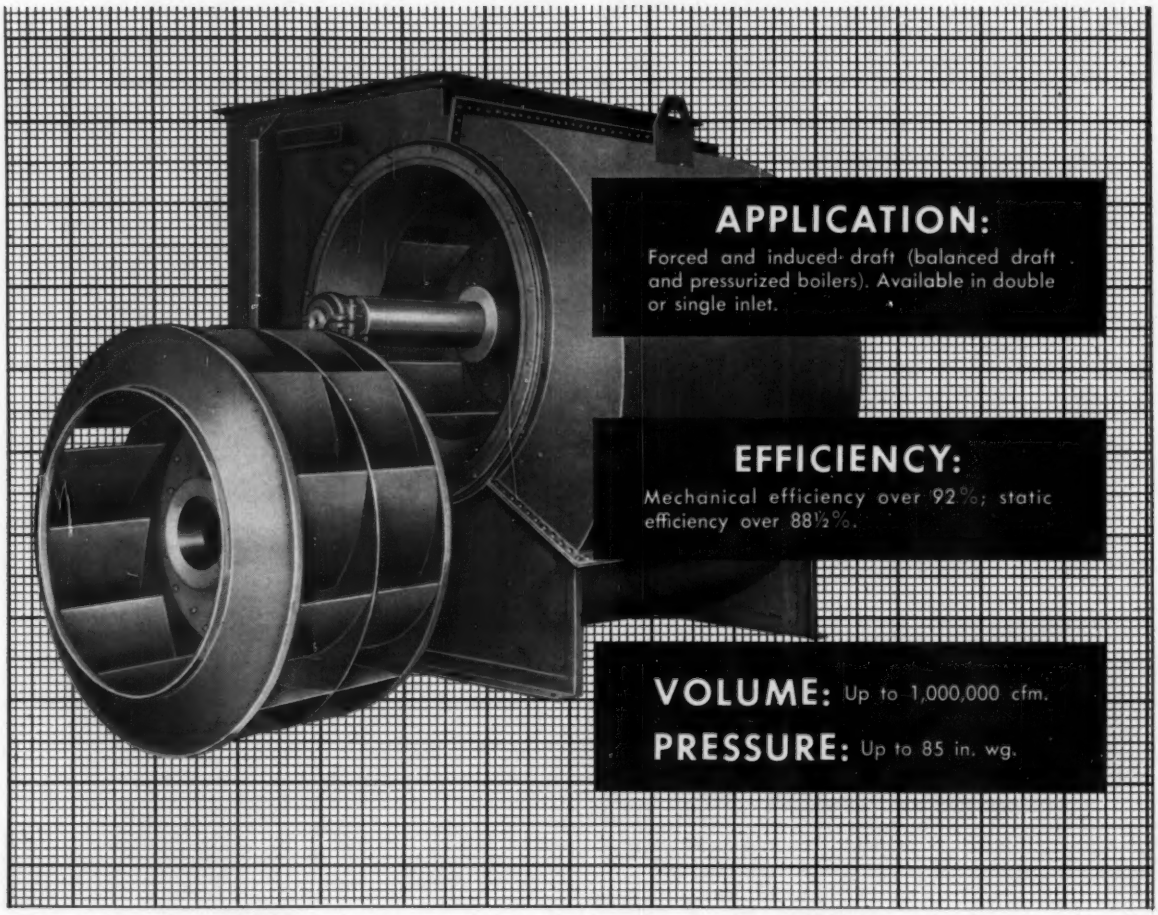
AMERICAN BLOWER AIRFOIL FANS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Forced and induced draft (balanced draft and pressurized boilers). Available in double or single inlet.
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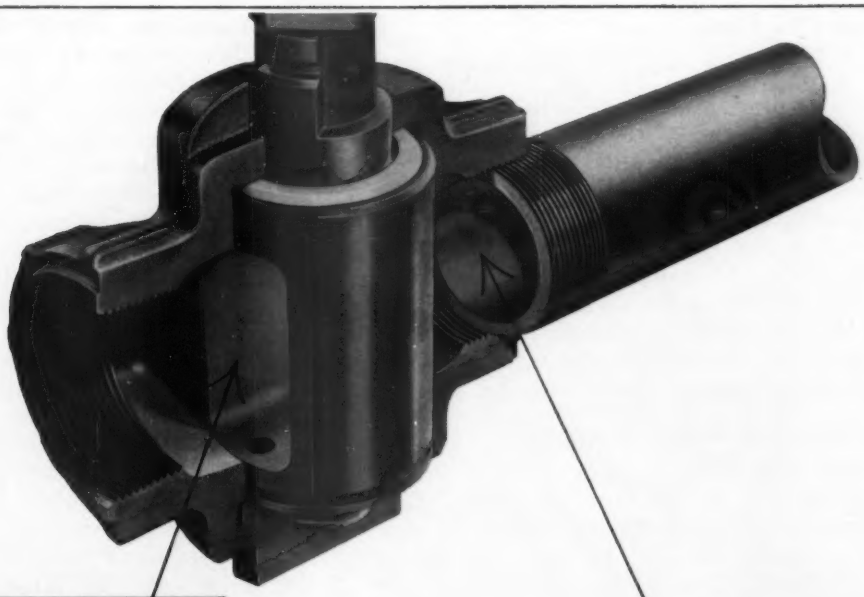

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5804

Charles C. Pate

– *Starts on front cover*

worked in the engineering department of the Missouri Pacific Railroad and later joined the U. S. Corps of Engineers as a civil engineer. Then with two decades' experience behind him, Pate opened a consulting engineering office in Tulsa in 1944 under the name of Pate Engineering Company.

The firm was incorporated under Oklahoma laws in 1948, and now handles work in Oklahoma, Kansas, Missouri, and Texas. Associated with Mr. Pate as one of the principals in the firm is his son, C. W. (Bill) Pate, who is also a civil engineer.

Specialized Engineering Groups

Primarily engaged in the design and supervision of heavy construction and municipal utilities, Pate Engineering specializes in three branches of civil engineering and has set up three engineering groups to handle these activities: bridges and highways; sanitary and water supplies; and hydrology as it relates to flood control. The firm employs an average of 20 persons, and all operations are directed from the sole office in Tulsa.

Current large highway projects on the firm's boards include engineering for a combination state and interstate project – U. S. highway 75 in Tulsa County – with an estimated cost of $2 million; a continuing contract for highways and bridges in Tulsa County for 1958-59, covering work estimated in excess of $1 million annually, and a continuing contract for highways and bridge construction in Washington County, consisting of improvements to all of the county roads, both locally and Federally financed, and involving total annual costs of about $850,000 during 1958 and 1959.

Sewer and water projects include two complete sewerage systems and a water system in Mayes County, Oklahoma, amounting to nearly a million dollars; a $1.5-million revision of water and sewerage systems for Eufaula, Oklahoma, needed because of the proposed Eufaula Dam; and a $2-million revision of water, sewer, and other municipally owned utilities in Cleveland, Oklahoma, necessitated by the impending Keystone Dam on the Arkansas River. In addition, Snug Harbor Village, Inc. has retained the firm to design and supervise construction of complete water, gas, and sewage systems for a resort area covering 11 square miles fronting on the Fort Gibson Reservoir. The estimated development cost is over $1.5 million.

Association Activities

Besides his interest in engineering, Charles Pate has a deep sense of professional responsibility and an abiding faith in the effectiveness of local and national association activities. Implementing these beliefs, Pate was one of the founders of the Consulting Engineers Council, and has served for the past two years as CEC first vice president. He also has been very active in the Consulting Engineers Association of Oklahoma, serving as president in 1955-56, and in both the Oklahoma and the National Society of Professional Engineers.

Because of the work of Pate and other dedicated men, in less than three years CEC has grown to an organization representing 21 state and regional associations of consulting engineers, and is recognized as a spokesman for consulting engineers before Congress and important Federal government agencies. Pate believes that these activities of CEC eventually will make consulting engineering as highly regarded as the medical or legal professions.

For the Future

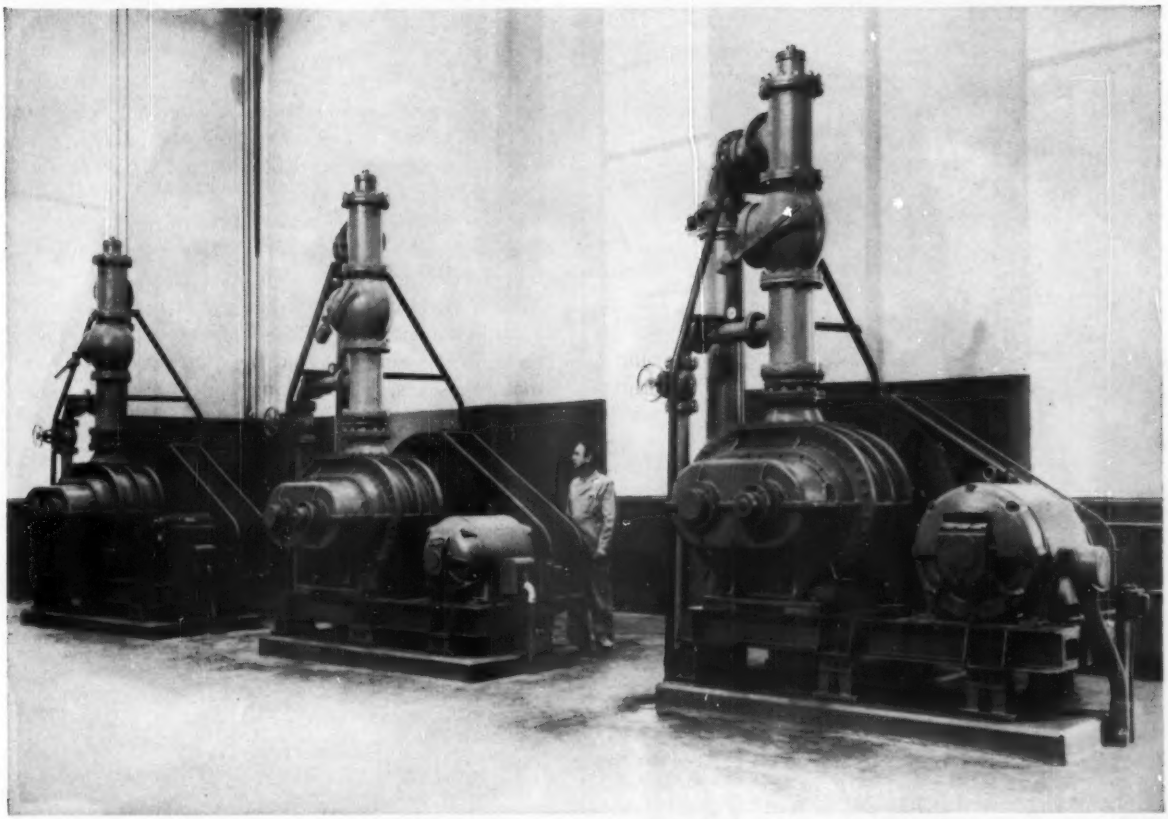
For the coming year President Pate has listed seven objectives to make CEC activities more effective:

¶ "We must continue our present organizational plans and activities, and endeavor to obtain a closer-knit and more efficient operating group from the executive committee through our standing and special committees, reaching into the membership of all of our member associations. This must include strengthening contacts with government officials on a national level in Washington.

¶ "We must broaden our means of communication. Our monthly newsletter has gone a long way in keeping the membership informed about activities, aims, and ideals of the Council, but due to space limitations it cannot carry the full story of all the activities in which the executive committee is involved. It is inherent in the thinking of an engineer that as long as he accomplishes the task assigned him, he has done a good job. This is only half the story. The members must know what has been accomplished so that they, individually, will be sufficiently informed to take full personal advantage of those accomplishments.

¶ "Member participation should be broadened by more individual activity. Like participation in amateur sports, more benefits are derived by the participant than by the spectator. The more time, energy, and thought contributed to Council activities, the greater the individual benefits will be.

¶ "Free engineering has been a recurring problem. Discussions with representatives of industry criticized for this abuse have brought out some facts that present a new perspective to the subject. This abuse is sometimes not the choice of industry. It results partly from a necessity to meet competition. It also can occur not only with the consent but at the request of some consulting engineers. This abuse should be combatted on an industry-wide



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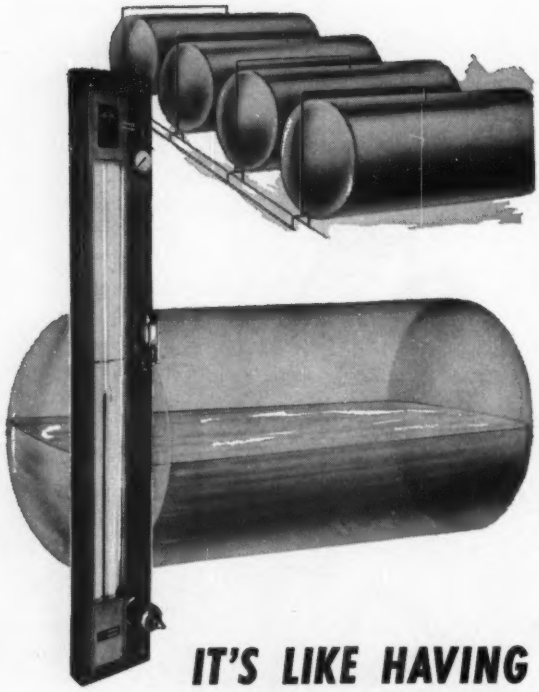

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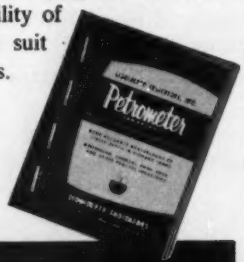

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basis rather than with the individual offender, and through joint effort it may be eliminated or at least greatly reduced. The principal approach to the problem should be on a basis of financial benefit to both parties. It is a long-range program, but we can hope for substantial improvement in the next year.

¶ "We must continue our efforts for more realistic fees and responsibilities for consulting engineers at the national level. Exploratory talks with government officials in Washington during the past year should be continued, with the objectives of larger fees and an increase in the professional responsibilities of the consulting engineer retained by government. In many instances, the consulting engineer retained by the government is merely a supplier of technicians, technical ability, and drafting room space. He should be assigned a role commensurate with his ability.

¶ "We should continue efforts for a broader recognition of the consultant's part in the building industry. A very large percentage of modern office or industrial building design is engineering rather than architecture. Equal recognition should be granted each of the professional services that go into the design of a modern structure. Recognition should begin at the writing of contracts, including by name the professional firms associated with the design, and the responsibilities of each should be spelled out. We believe this procedure will result in a much better designed structure that will provide the client or owner with a more efficient and serviceable building at less cost than can be provided through the present method of contractual arrangements which allow the prime contractor to shop for professional services to be performed under his direct supervision.

¶ "I believe we should be realistic and accept the fact that most violations of codes of ethics are due to a lack of understanding of their specific meaning rather than a willful desire to take advantage of a colleague. I suggest that the Ethical Practice Committee set out a detailed code of ethics, spelling out in plain terms what is intimated but never specified in other codes. These can and should be written so they are as easily understood as the original Ten Commandments. Legal phraseology, normally inserted to ease the conscience of the offender, should be omitted. When this code has been prepared and approved by our Board of Directors, it should be sent to the member associations for their guidance and use—for the moral improvement of their members through education. I do not believe CEC should attempt to act as an enforcement agency for member associations, but it should act in an advisory capacity by establishing a uniform code of ethics that can be easily understood by all of our members. ▲▲

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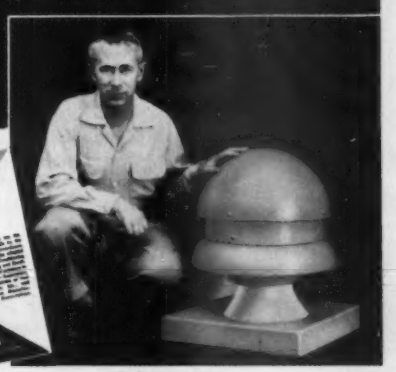

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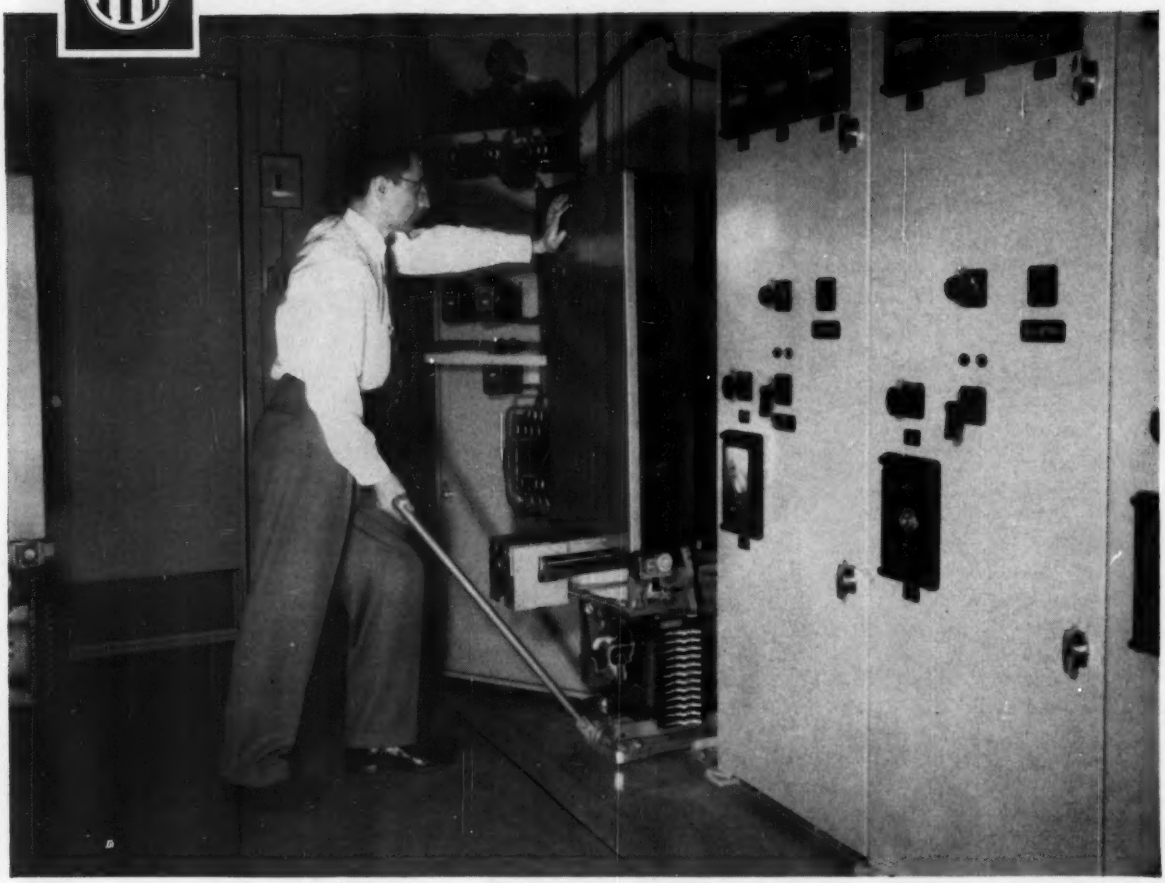


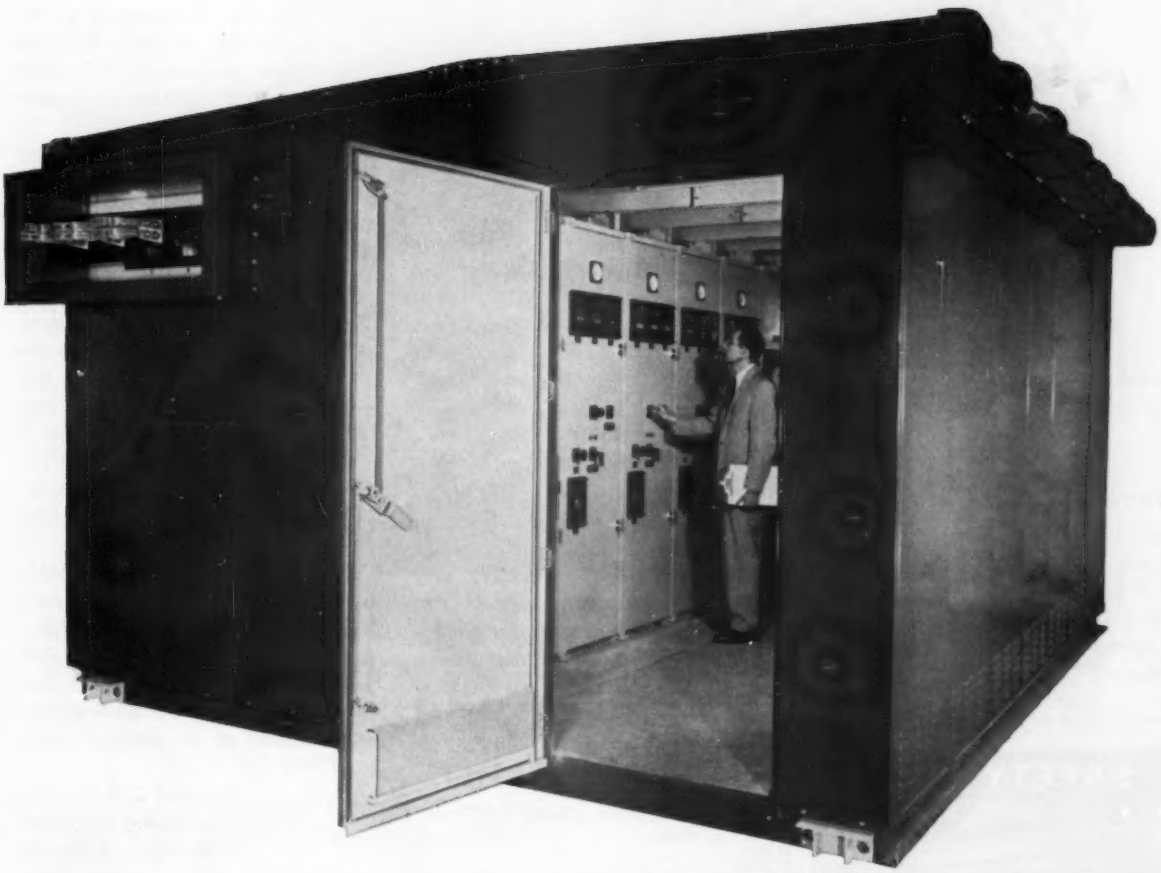
Walk-In Outdoor Shelters Now Being Installed

Hinged rear doors afford easy access to rear of switchgear.

Now available are I-T-E Walk-In Shelters for housing metal-clad switchgear in outdoor locations. These are being produced to meet a growing demand, and already two installations of this I-T-E development are in progress. They render the big service of permitting personnel to maintain switchgear in defiance of weather. These I-T-E Walk-In Shelters feature all the following advantages:

- **Completely gasketed doors, side sheets and frames. Doors are sealed with cellular neoprene sponge; side sheets and frames are sealed with wool felt, impregnated with chromite.**

- **All parts are treated for rust resistance, painted and baked prior to assembly. This protects the metal against rust and corrosion. Further, the bottom of the entire unit is undercoated.**



to Protect Service Personnel Against Weather

- **The shelter is completely self-sustaining. It is equipped with ventilating louvers, lights, heating units and convenience outlets.**
- **The entire structure is strong enough to be pier mounted, if desired, with resulting increased savings.**
- **Hinged rear doors afford easy access to rear of switchgear.**
- **Transformer connections can be made through weatherproofed throats, roof bushings, or underground cable, as required.**
- **Space is provided for storing grounding devices or spare circuit breakers.**
- **Nonskid flooring insures safe footing for operating personnel.**
- **Standard shelters are available for any size switchgear assembly.**

For complete information about I-T-E Walk-In Shelters for switchgear, contact your nearest I-T-E sales office or write Switchgear Division, I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa. In Canada: Eastern Power Devices Ltd., Port Credit, Ont.

I-T-E CIRCUIT BREAKER COMPANY

PHILADELPHIA, PENNSYLVANIA

Readers' Comment

Mistake Noted

Sir:

Look at the picture in the lower left-hand corner of page 83 of your May issue in an article entitled "Tornadoes – How to Handle Them." The caption refers to "bricks." The material is obviously concrete block.

Reinforced brick masonry has been successfully resisting earthquakes in California for years. Last year at the AEC-FCDA atom bomb tests, a reinforced brick masonry school classroom successfully withstood an overpressure of more than 5 psi.

Clayford T. Grimm, P. E.
Structural Clay Products Institute
Washington, D. C.

• READER GRIMM IS RIGHT. AND THERE WAS ANOTHER ERROR IN THE CAPTION. THE BRYAN, TEXAS COURTHOUSE WAS PHOTOGRAPHED DURING CONSTRUCTION, NOT AFTER A TORNADO. SO FAR AS WE KNOW, THE COURTHOUSE STILL IS STANDING. NOT SO THE CAPTION-WRITER.

Not Construction Alone

Sir:

I have read with great interest your article entitled "This is the Way Consulting Engineers Serve Private Clients" in the May issue.

The objective, of course, is commendable. However, do you for one moment believe that "the consulting engineer works in a fairly narrow engineering field (construction)" as stated on page 117? How about the many consultants who practice in other fields?

On page 126 you refer to "jobs the consulting engineer can't do." Don't you feel there are some engineers who would take issue with you, and don't you feel that you may be doing them a disservice by the statements on this page?

I know some wonderful engineers in the field of "pure process work," and I know of excellent jobs done by consultants in the field of "long-range planning and establishment of over-all objectives." And, if you would be interested, I could give you the name of a very fine engineering company that has been quite successful with pilot plant work, in addition to regular construction activities.

Gilbert I. Ross
Ross & Company
New York City

Reprints Requested

Sir:

Your discussion in the May issue of the way consulting engineers can serve clients is of benefit to the general public as well as the consulting profession. I suggest that a bulk-reprint rate be established and that consultants include a reprint any time a brochure is presented to a potential client.

CONSULTING ENGINEER is rapidly becoming THE spokesman and best critic of the profession. I have found its contents informative and interesting and sincerely hope that the quality of the editorial matter will remain at its present high level.

Raphael G. Kazmann
Consulting Engineer
Stuttgart, Arkansas

• REPRINTS OF THE SERIES OF THREE ARTICLES ON HOW CONSULTING ENGINEERS SERVE PRIVATE CLIENTS, (MAY), PUBLIC CLIENTS (JUNE), AND ARCHITECTS (JULY) WILL BE AVAILABLE.

A Debatable Magazine

Sir:

As chairman of the Young Engineer's committee in the Massachusetts Society of Professional Engineers and as an alternate reporter for the *New England Professional Engineer* magazine, I am constantly on the watch to secure material for open debate at meetings or of interest to all our professional engineers, and I have found your magazine to be such a source. I recently obtained a March copy and found your "Readers' Comment" column, "Heard Around

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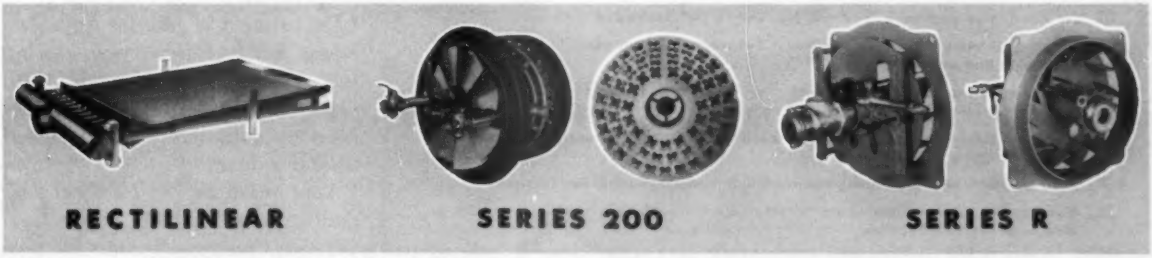
All external components are included as a part of the Webster packaged unit.

Webster control and combustion equipment will be installed, adjusted and tested under direct supervision of a technical representative.



RECTILINEAR SERIES 200 SERIES R

Webster Packaged Combustion and Control Panels designed, fabricated and installed under factory trained supervision means single responsibility for performance.

All components are designed to work together — it's common sense to expect the manufacturer of the combustion equipment to build a better safeguard control system.

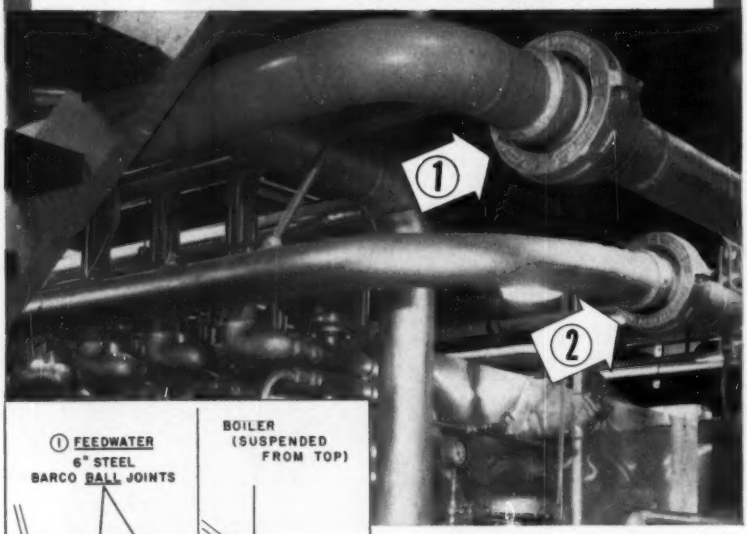
Write for Bulletin AP-5/1 Series — Control Systems and Webster Burner Catalog.

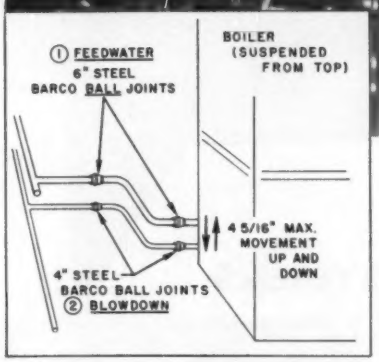
The WEBSTER ENGINEERING COMPANY

TULSA, OKLAHOMA

Division of SURFACE COMBUSTION CORPORATION, Toledo, Ohio

. . . where BOILERS move UP and DOWN





BARCO Ball Joints

The schematic diagram at left shows how Barco Flexible Ball Joints of steel construction are used in a new Florida utility plant—design pressure 600 psi, 500°F. The above photo shows a close-up view of two of the joints (see arrows). Two more matching joints, 4" and 6", are located out of the picture to the left. The 4" joints have metal gaskets. The same utility also uses 10" Barco joints on gas fuel lines. Other uses in power plants are for flexible connecting lines to oil burners, soot blowers, and other auxiliary equipment.

Flexible Pipe Connections!

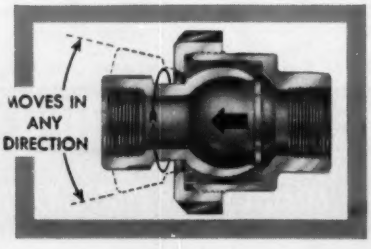
The rapidly increasing use of Barco Flexible Ball Joints for solving piping problems in POWER PLANTS is significant for several key reasons:

1. **Substantial *space saving* as compared to other methods in crowded piping areas.**
2. **Unlimited flexibility and movement. Utmost simplicity.**
3. **No heavy pipe anchoring required. No "end thrust" developed under pressure.**
4. **Ability to handle compound movement (where twisting is combined with thermal expansion and contraction).**
5. **Easy to engineer joints into piping to provide for any degree of flexibility, expansion, or movement required.**
6. **Maximum safety for high temperature applications. All-metal construction available. Special alloys can be specified.**
7. **Basic design is pressure sealing against leakage and self-adjusting for wear.**
8. **Virtually no deterioration. Able to stay in service for years without repairs or maintenance. No lubrication.**

New Bulletin No. 31 contains interesting diagrams showing how to solve many common pipe expansion problems EASILY, ECONOMICALLY. *Ask for a copy;* see your nearest Barco representative or write:

PRODUCTS BACKED BY EXPERIENCE
BARCO
ANNIVERSARY
50TH

BARCO MANUFACTURING CO.
572H Hough Street, Barrington, Illinois
The Only Truly Complete Line of Flexible Ball, Swivel, Swing and Rotary Joints
In Canada: The Holden Co., Ltd., Montreal



Headquarters," and "The Legal Aspect" were excellent for such purposes.

Unfortunately, however, I can only find these magazines when one of my fellow engineers has thrown them away. Therefore, could you put my name on your mailing list to receive CONSULTING ENGINEER? I have heard that you accept such requests.

If you cannot forward me up-to-date issues, can you possibly send me back issues each month?

Robert E. Simon
Massachusetts Society of
Professional Engineers
Weymouth, Massachusetts

• READER SIMON HAS BEEN ADDED TO OUR CIRCULATION LIST.

Per Diem Payment

Sir:

Concerning the "Report from the East Coast" in the May issue: apparently your editor is under the impression that there is only one Federal law governing the maximum per diem which may be paid consultants by the various agencies, and that this maximum is $50.

Such is not the case. The maximum per diem applicable to the various agencies is stated in the annual appropriation measure for the agencies, and the amounts vary from $50 to $100. To illustrate, we cite below some of the current appropriations acts in this regard:

¶ Department of Interior Appropriations Act for fiscal year ending June 30, 1957. Public Law 573, 84th Congress, Section 104 provides rates for consultants not to exceed $100 per diem.

¶ Appropriations Act for fiscal year ending June 30, 1958. Public Law 77, 85th Congress, Section 104 provides rates for consultants not to exceed $75 per diem.

¶ Appropriations Act for fiscal year ending June 30, 1959. H. R. 10746 provides rates for consultants not to exceed $75 per diem.

¶ Department of Commerce Appropriations Act for fiscal year ending June 30, 1958. Public Law 52,

Goulds Fig. 3173
heavy-duty vertical
centrifugal process pump.

YOUR SPECIAL PUMP AT STANDARD PRICES

Need a heavy-duty vertical process pump?

Goulds will build it—in the proved centrifugal style—from standard parts. You save the cost of custom-building; you get fast delivery.

When you want to change vessel depth or pump ratings you merely replace standard stock parts. Units may be adapted in the field. Shafts and pipe columns are available for any pump length from 2 to 20 feet in 6-inch increments.

Other features:

Pump assembly and cover plate form a unit. Interlocking male and female fits keep the unit in permanent alignment.

Internal impeller clearance is easily adjusted from the outside.

Upper bearings can be replaced without disturbing pump or piping. Just remove motor and coupling.

Upper bearing completely protected from pit fumes and weather.

There are types for wet or dry pits, with capacities to 1080 GPM or heads to 290 ft. Vaporproof construction is available. Furnished in all iron or bronze-fitted construction.

Complete details in Bulletin 726.2. Also available in stainless steel and special constructions for handling corrosives.

GOULDS
PUMPS FOR INDUSTRY

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Main Office and Works
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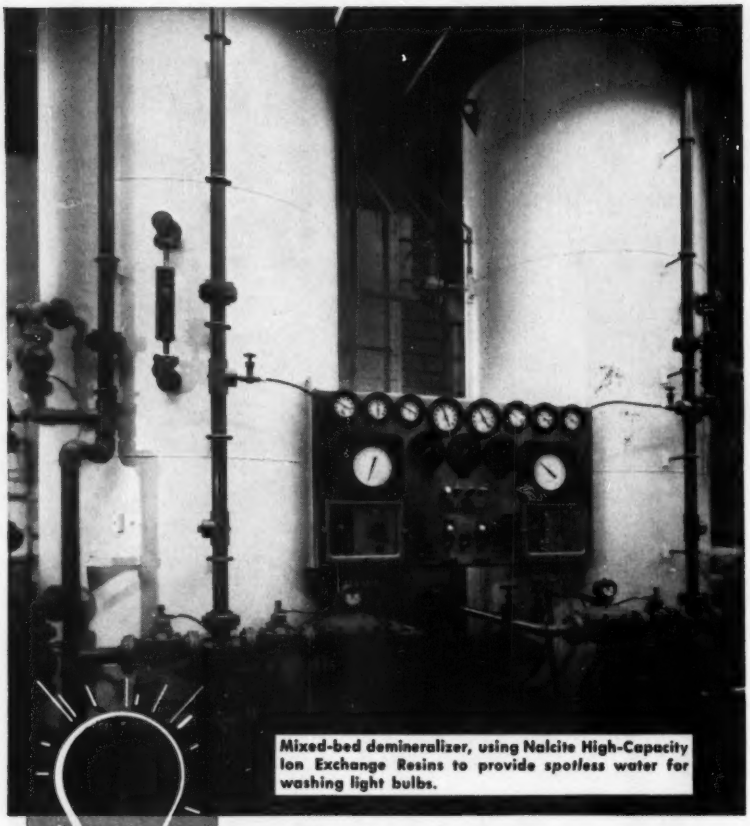
Mixed-bed demineralizer, using Nalcite High-Capacity Ion Exchange Resins to provide spotless water for washing light bulbs.

BRIGHT IDEA!
for spotless light bulbs

Nalcite® DEMINERALIZED WATER

Highest quality demineralized water is needed to wash light bulbs to sparkling spotlessness for this major manufacturer . . . Nalcite Cation and Anion Exchange Resins, working in a modern mixed-bed demineralizer, do the job here — as they can do it on any water that needs upgrading for most efficient use.

Whether you want to wash a light bulb or get better boiler feed water, Nalcite Exchangers have capacity, stability and other performance advantages you should know about.

NEW WATER CONDITIONING HANDBOOK
Sixty pages of concentrated data and useful tables on water conditioning with Nalcite Ion Exchangers. Your copy free on request. Ask for Bulletin Z-5.

NATIONAL ALUMINATE CORPORATION
6180 West 66th Place Chicago 38, Illinois
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Serving Industry through Practical Applied Science

85th Congress, Section 103 provides a rate not to exceed $50 per diem.

¶ Bureau of Public Roads, Department of Commerce, for fiscal year ending June 30, 1058. Public Law 52, 85th Congress provides a rate not to exceed $100 per diem.

¶ Department of Defense Appropriations Act for fiscal year ending June 30, 1958. Public Law 117, 85th Congress, Section 601 provides a rate not to exceed $50 per diem.

Our letter of March 11, 1958 to the Congressional Appropriations Committees dealt with the problem in general, but used the Department of Interior situation as an example.

Milton F. Lunch
Legislative Counsel
NSPE

Ethics in Review

Sir:

In the May issue of your excellent magazine you published an article on Fee Schedules for Consulting Engineers. This was of particular interest to me because I am chairman of Task Force No. 2, Fee Schedules in the NSPE Consulting Engineers Functional Section. The bibliography you published is quite comprehensive.

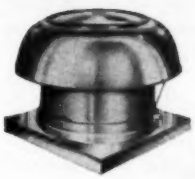
A feature of the article is the chart which shows the range of values of basic fee schedules. This illustration should get some attention as it is a rather novel presentation of the comparison of fees. Coming at the head of an article which is "Staff Prepared," the inference would seem to be that the staff had prepared this chart summary. There is no caption or credit line to indicate that the source was the NSPE Task Force No. 2 report published in 1956, from which the chart illustration obviously was directly reproduced.

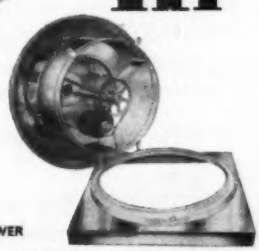
My experience in the editorial field is rather limited and I am not familiar with the ethical practice that might apply in such a case. Certainly there is no copyright question involved. These questions

JENN-AIR LAUNCHES

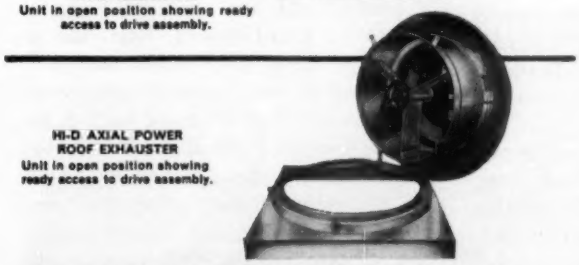
TWO NEW STARS INTO ORBIT

Hi-D CENTRIFUGAL AND AXIAL POWER ROOF EXHAUSTERS





HI-D CENTRIFUGAL POWER ROOF EXHAUSTER
Unit in open position showing ready access to drive assembly.



HI-D AXIAL POWER ROOF EXHAUSTER
Unit in open position showing ready access to drive assembly.

Observe These Outstanding Features Shared in Common by 2 New Jenn-Air Hi-Discharge Exhausters:

1—*Maintenance-Free all-aluminum housing* supplies strength without weight.

2—*Bird guard* of heavy gauge stainless steel construction comes as an integral part of every unit.

3—*Special vibration absorbers* reduce noise to an absolute minimum.

4—*Totally enclosed* full ball bearing, permanently lubricated, motor assures smooth, uninterrupted service. Air cooled application adds years to motor life.

5—*Tubular drive assembly* has permanently sealed, pre-lubricated ball bearings.

6—*Motor and drive* can be serviced from interior of building, if desired.

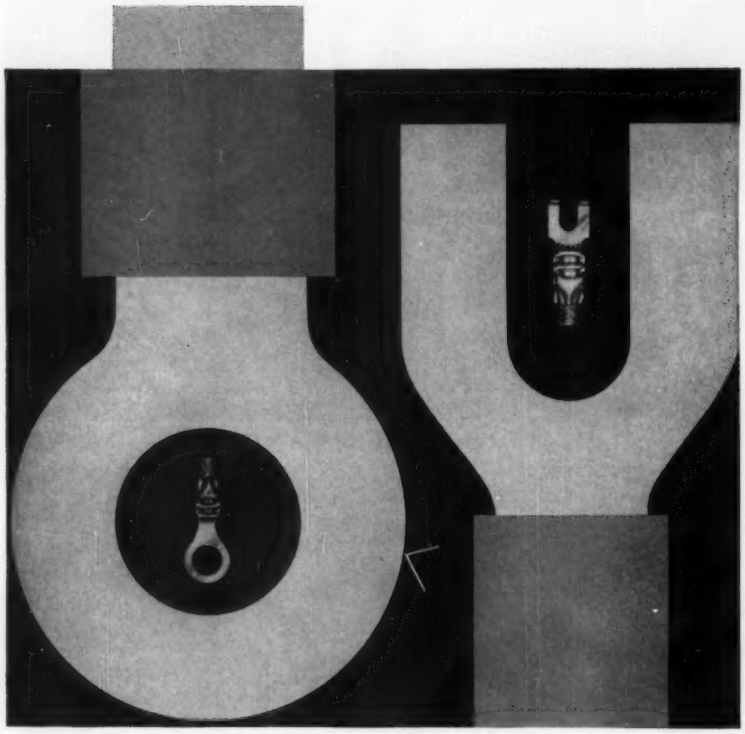
7—*Specially designed hinge* on housing permits ready access to damper and drive. Positive stopping device holds unit in open position. Simple locking mechanism keeps it tightly closed.

Now, for the first time, aluminum belt driven units combine high discharge with low-contour appearance

Since 1947 the power exhauster industry has looked to Jenn-Air for leadership. Now Jenn-Air starts its second decade by introducing two new and useful additions to its line: Hi-Discharge *Centrifugal* Power Roof Exhauster, Series HCB; and Hi-Discharge *Axial* Power Roof Exhauster, Series HAB. These exhausters fill the need for general area ventilation and have a clean engineering design that features compactness and serviceability. By locating the wheel at the top you derive the advantage of a high point of discharge which allows low curb construction. Thus, Jenn-Air units offer the lowest overall height of any exhauster on the market. Once you compare, you will decide on Jenn-Air.

JENN-AIR PRODUCTS COMPANY, INC.
1103 Stadium Drive • Indianapolis 7, Indiana

Member of Air Moving and Conditioning Association



For perfect insulated termination . . .

faster . . . specify the AMP®

PRE-INSULATED DIAMOND GRIP terminal

If you need terminals with bonded insulation—if you need corrosion resistance and wire-supporting vibration resistance—you have it instantly in one closure of A-MP's matched crimping tool. Only one lightning-quick step for crimp-sure optimum strength and conductivity. A-MP PRE-INSULATED DIAMOND GRIP Terminals exceed the most rigid military and commercial specifications.

A-MP's precision-engineered terminals are matched to precision-engineered tools that make an exact crimp every time, never too little, never too much. Perfect terminations—whether you need one or a million. No great operating skill necessary. A-MP's match-mated tooling does all the work and at lower installed cost than other methods of wire termination. Wire range is from No. 26 to No. 10.

To solve your wire-end problems, we maintain an international engineering service.

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of ethics do become difficult to define sharply.

That same thought is expressed on Page 42 of the same issue in an editorial review of an action by Task Force No. 3 of the same Functional Section. Without knowing all the details, it is easy to have a difference of opinion between black and white or, as expressed in the editorial, in the grey region. However, the editorial jumps right on the black side with the conclusion that this action of the committee should cause the Founder Societies to "shiver at the thought" of turning ethics over to NSPE.

Maybe there is no reason for me to relate these two matters, except that one raises a small question of ethics and the other states a broad answer on ethics. I can only express a hope that CONSULTING ENGINEER magazine and the Consulting Engineers Functional Section of NSPE may some day come a little closer together on these views.

Frank Sanford
Commonwealth Associates, Inc.
Jackson, Michigan

• AS READER SANFORD POINTS OUT, THERE SHOULD HAVE BEEN A CREDIT LINE UNDER THE CHART.

Payment for Canceled Jobs

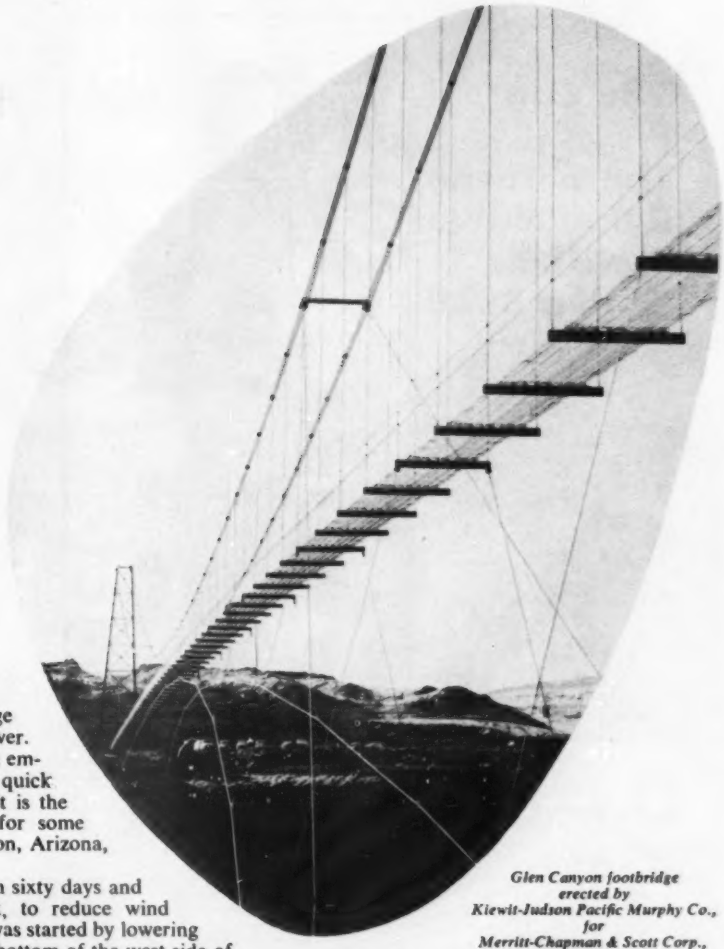
Sir:

The subject of consulting engineers not being reimbursed for preliminary work on canceled projects (West Coast Report, June) has a great many ramifications and gets involved with ethical considerations of whether or not work is to be done on a speculative basis. Any engineer who deliberately and knowingly enters a speculative venture gambling that the work may go through and thus provide an engineering assignment is looking for trouble and usually gets it. This procedure is harmful to the profession and the clients.

Over the years our office has had little difficulty obtaining compensation for preliminary work done on canceled jobs. Maybe we have been lucky, maybe our contracts

ROEBLING
BRIDGE STRAND
SPANS A CANYON
TO MAKE

The Longest Footbridge in the U.S.

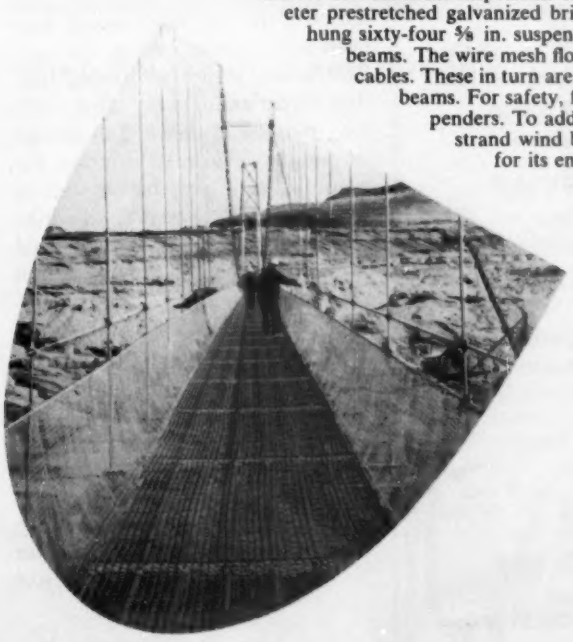


Glen Canyon footbridge erected by Kiewit-Judson Pacific Murphy Co., for Merritt-Chapman & Scott Corp., prime contractor for the Glen Canyon Dam.

Seven hundred feet above the Colorado River at the Glen Canyon Dam site in northern Arizona, this suspension bridge extends 1280 feet from tower to tower.

Designed as a walkway for project employees only, it provides ready and quick access to both sides of the river. It is the only span across the Colorado for some 200 miles between Marble Canyon, Arizona, and Moab, Utah.

The bridge was completed in sixty days and features a steel mesh deck, to reduce wind resistance. Construction was started by lowering two ⅝ in. cables to the bottom of the west side of the gorge, transporting them across the river by boat and raising them on the east side by block and tackle. The six main suspension cables are 1¾ in. diameter prestretched galvanized bridge strands. From them are hung sixty-four ⅝ in. suspenders, attached to 7 ft-wide floor beams. The wire mesh floor is laid on eight 1 in. diameter deck cables. These in turn are supported every twenty feet by the floor beams. For safety, four handrail cables are attached to the suspenders. To add stability in strong winds, two 1¾ in. bridge strand wind brace cables run below the deck on either side for its entire length.



This is an extremely long example of Roebling's readiness to supply bridge strand for any kind of bridge or suspension structure. Add engineering facilities and experience that are immediately applicable to any suspension problem, and you have the combination of product and knowledge that make Roebling the leader in the design and erection of suspension systems of *every* description. Your inquiries on any and all phases of suspension by wire rope or strand are invited. Bridge Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

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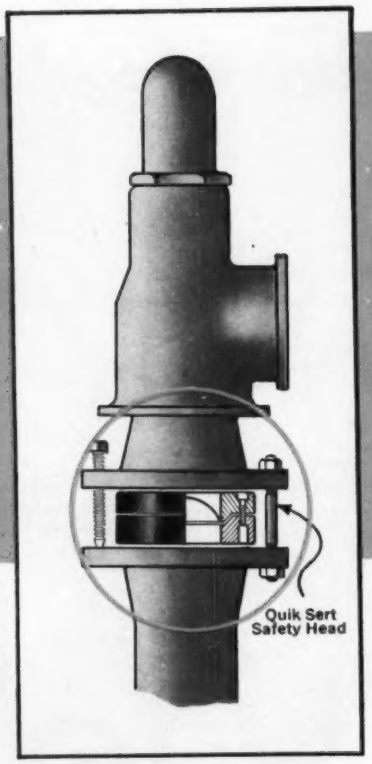
Subsidiary of The Colorado Fuel and Iron Corporation

You Can Prevent These Three Relief Valve Problems With a BS&B Quik-Sert *Safety Head!*

BEFORE

AFTER



Leakage
Corrosion
"Freeze-ups"

The BS&B Quik-Sert Safety Head isolates the relief valve from the product under pressure. Mounted under the valve inlet, it is "bottle tight" until overpressure reaches the rated pressure of the preformed metal rupture disc.

The Quik-Sert Safety Head flange assembly is located inside the bolting of companion flanges. Easy insertion and removal is accomplished through the use of jack screws.

A BS&B Quik-Sert Safety Head Under the Relief Valve Gives You These Advantages

- Stops product loss at normal operating pressures
- Assures proper valve function at set pressure
- Lowers maintenance costs
- Reduces shutdown time

BS&B engineers will be glad to evaluate your pressure system for proper applications of the Quik-Sert Safety Head.

BS&B — ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

Write, wire or phone...

BLACK, SIVALLS & BRYSON, INC.

Safety Head Division, Dept. 2-FX7
7500 East 12th Street, Kansas City 26, Missouri
Telephone: BEnton 1-7200

have been adequately drawn, or perhaps more important than even these is the fact that our clients have been persons who realize that proper compensation is due for all authorized work. On government work we have always obtained compensation for authorized work done up to the time of notice to suspend or stop operations. It is, of course, necessary to demonstrate the progress and work done, but this should present no serious problem. All contracts should contain a clause for compensation to the engineer on a cost-plus or other arrangement in case of cancellation.

I think the two particular hazards of not obtaining compensation in such cases, if the contract is properly drawn, exist where the engineers work too far ahead of the various approved stages of the engineering operations (for example, going into final design considerations before the preliminary schemes are approved) and not properly advising the client early in the job about any incompatibility between what he wants and the estimated cost. People do not like to pay fees for drawings that bring in bids far above the budget.

There is one other element of this matter that is usually not compensated for and may be a severe hardship on an engineering firm even if the work done is covered. This is the matter of having sudden stops and starts, often with long periods of delay. The abrupt suspension of a large contract, for example, can play havoc with a design office's working schedule, personnel, and costs. It is unusual for an engineering firm to obtain proper compensation for such abrupt suspensions or terminations. Construction contracts usually obtain something for anticipated profit and disruption of organization in such cases. This is something that the engineering profession might well consider.

John A. Blume
John A. Blume & Associates
San Francisco

When the building and the heating system are made for each other . . .

When you specify Custom Webster Walvector, you marry the heating system to the building design . . . blend them with each other for maximum comfort, beauty and economy. Never does Custom Walvector appear to be just "added" to a building. Instead, it becomes a part of the structure itself. And its wide variety of enclosure types meet every design need.

Custom Walvector uses modern HYDRONICS at its tailor-made best. Here is Webster Tru-Perimeter Heating . . . for hot water or steam . . . for heating comfort everywhere.

Put the Warren Webster Man in your plans . . . by letting him add Custom Webster Walvector at the blueprint stage. Talk it over with him now . . . or write for Bulletin B-1553. Warren Webster & Company, Camden 5, N. J. Since 1888. Offices in principal U.S. cities and Canada.

WEBSTER'S
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PRODUCT

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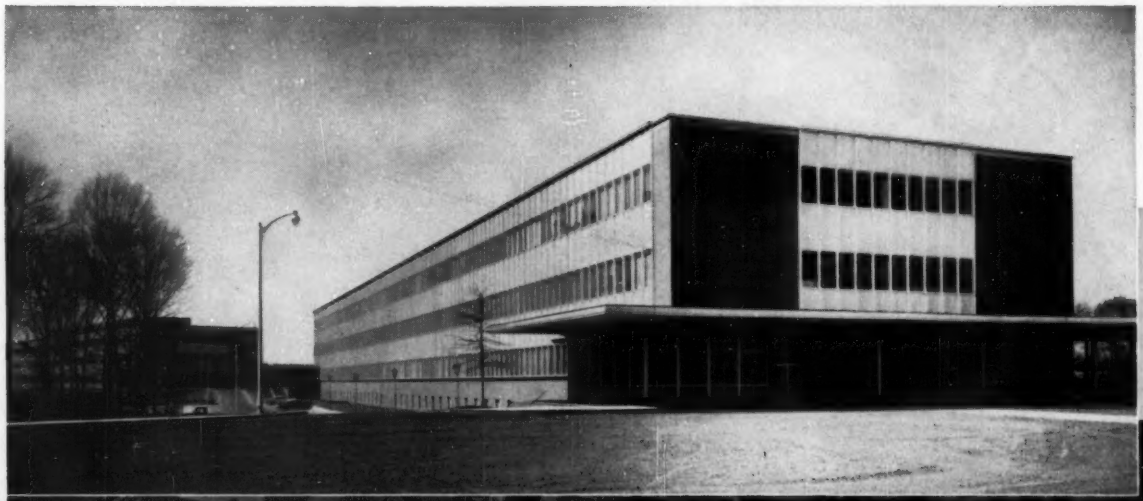
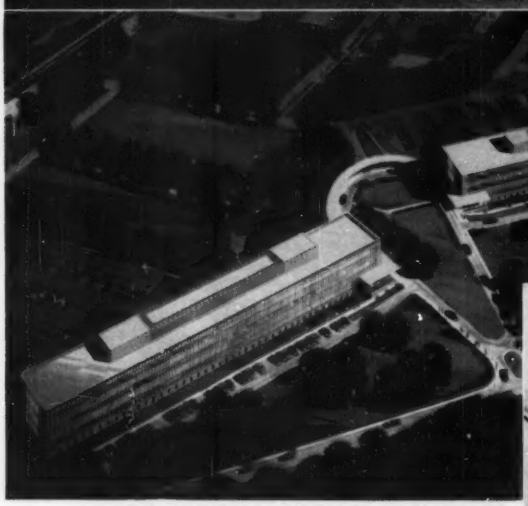
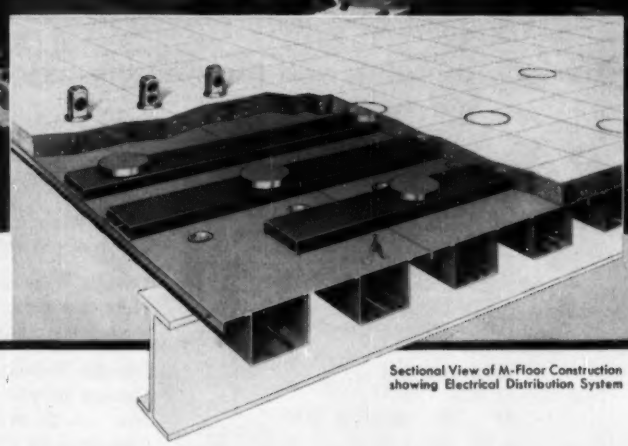
WARREN WEBSTER
HEATING . . . COOLING

Mahon M-FLOOR Cel-Beam





The Three Ultramodern Ford Motor Company Staff and Product Engineering Buildings, illustrated here, are constructed with Mahon Electrified M-Floors throughout. Roofs of these Buildings and Connecting Canopies are constructed with Mahon Cellular Steel M-Decks. Architects: Voorhees, Walker, Smith & Smith, New York, N.Y. General Contractor: O. W. Burke Co.



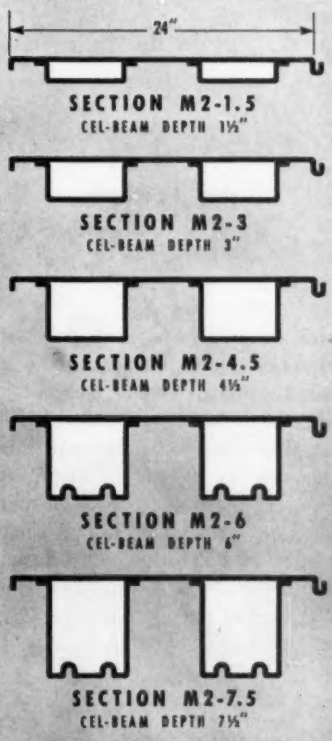
Sectional View of M-Floor Construction showing Electrical Distribution System

Serving the Construction Industry Through Fabrication of Structural Steel, Steel Plate Components, and Building Products

Sections Give You a More Practical and a More Efficient Structural Unit!

6″ Wide Cel-Beams Provide Adequate Raceway Capacity . . . Permit Greater Latitude in Location and Installation of Floor Service Fittings

MAHON
M-FLOOR SECTIONS



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- Insulated Metal Curtain Walls
- Underwriters' Rated Metalclad Fire Walls
- Rolling Steel Doors (Standard or Underwriters' Labeled)
- Steel Roof Deck
- Long Span M-Decks (Cellular or Open Beam)
- Permanent Concrete Floor Forms
- Acoustical and Troffer Forms
- Acoustical Metal Walls and Partitions
- Acoustical Metal Ceilings
- Structural Steel—Fabrication and Erection
- Steel Plate Components—Riveted or Welded

☆ *For INFORMATION See SWEET'S FILES or Write for Catalogues*

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Sales-Engineering Offices in Detroit, New York and Chicago
Representatives in all Principal Cities

of Steel and Aluminum

MAHON

The Reader's Guide

Shopping Centers

Perhaps the most impressive change in urban life in the past decade has been in the shopping habits of the American housewife. Back in the 20's and 30's the lady of the house would once or twice a week catch the street car or bus and go shopping downtown. But with the purchase of the second automobile in the family or the taking over of the first car by the wife, all this changed. There were too many automobiles downtown. Parking became a near impossibility. It was easier to shop in neighborhood stores. Suddenly, a whole new pattern of life evolved, and merchants found it wise to build new stores in the suburban areas, stores built for customers who shopped by automobile. Quickly the concept of the neighborhood, the community, or the regional shopping center developed. And while hundreds of millions already have been spent in their construction, this is only the beginning. This construction boom is of particular importance to consulting engineers, for as Richard Tatlow, president of Abbott, Merkt & Company, points out in his introduction to our Special Section on Shopping Centers (page 85), these "merchandising marvels of the Twentieth Century are more than 70 percent engineering design."

Teaching the Teachers

Our Survey of the Profession published at the beginning of this year showed that consulting engineers are not only cognizant of but thoroughly upset by the lack of understanding of their professional function. Not only does the general public not understand the work of the consultant, but the same is true of many engineers in industry and government. One way to overcome this, according to John C. Hitt, of Jackson & Moreland, is for consulting engineers themselves to undertake a program designed to enlighten both the students and the faculties of engineering colleges. Hitt has some good practical suggestions as to how this can be done. See "Teaching the Schools About Consultants," starting on page 82.

Dealing with Architects

About a third of the consulting engineers in this country have architects for clients. It is important, therefore, that the architect-engineer relationship be a healthy one. Unfortunately, it is not always either healthy or happy, according to CONSULTING ENGINEER's Committee of One-Hundred. Most members of the Committee think that there are too many architects who undervalue the engineering design of a project, and one way or another they try to get the cheapest rather than the best engineering for the owners. The Committee's feeling is that conditions are getting worse rather than better, as architectural firms find their costs rising and their fees standing still. Several suggested solutions are offered by the Committee, but all will call for determined action by the consultants who serve architects as clients. See "Dealing With the Architect Client," on page 122.

FIDIC's Invitation

With about 30 percent of our U.S. engineering firms having experience with foreign projects, good relations with consulting engineers, contractors, and suppliers in other parts of the world is of utmost importance. In fact, we feel that the invitation of the International Federation of Consulting Engineers (FIDIC) to the Consulting Engineers Council of the United States can be looked upon as an action of considerable concern to every engineer in private practice. A report on the Oslo meeting of FIDIC, the meeting at which this invitation to membership was issued to the Council, will be found on page 116. Editorial comment on the meaning of this action is printed under "Scraps and Shavings" on page 34. At this same Oslo meeting FIDIC also invited the South African Association to become a member. To find out about that association and current conditions of private practice in South Africa, see "Report from Africa," starting on page 138.

KOOL KOIL

FLUORESCENT LAMP BALLASTS for RAPID START LAMPS

Just as ADVANCE led the way in solving the heat problem with KOOL KOIL Series-Sequence Ballasts for Slimline Lamps, the world's largest exclusive ballast manufacturer now brings you a KOOL KOIL Ballast to end Rapid Start Ballast heat problems . . . and gives you conclusive proof . . . data of actual tests that proves KOOL KOIL superiority.

In a typical 4-lamp surface-mounted lighting unit with metal sides and glass-bottom diffusers under actual operating conditions its performance is amazing:

The maximum coil temperature was 22°C lower than Ballast "A" and 17°C cooler than Ballast "B". The KOOL KOIL maximum case temperature was 10°C lower than any other ballast tested . . . and the most startling fact of all is that the ADVANCE KOOL KOIL Ballast was *the only ballast tested that did not overheat the capacitor insulating oil to a temperature exceeding the manufacturer's warranty limit.*

The KOOL KOIL maximum condenser temperature in a surface-mounted 4-lamp, completely enclosed lighting unit was only 68°C. Ballast "A" exceeded the 70°C warranty temperature by 12°C and Ballast "B" exceeded it by 9°C.

To solve your ballast heat problems, be sure to specify ADVANCE Rapid Start (Cat. No. RS-2E40) or Slimline (Cat. No. RSH-2E75-S) KOOL KOIL Ballasts. Remember, they operate within condenser warranty limits . . . give 15% to 20% more light output . . . last 3½ to 4 times longer than old-fashioned ballasts. Write today for test data and details!

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NATION ENDORSES

Pittsburgh Firm Announces New Metal Discovery

PITTSBURGH (AP) — A. M. Byers Co. put on the market today a new kind of wrought iron described as the most significant development in the history of the metal.

This description was given at a news conference yesterday by B. M. Byers, president of the Pittsburgh firm. It is the world's largest maker of wrought iron products.

The improved product, known as 4-D wrought iron, is at least 25 per cent more resistant to corrosion than

Firm Producing Corrosion-Proof Wrought Iron

A new 4-D wrought iron has been announced by the A. M. Byers Co., Pittsburgh, according to E. G. Sullivan, field service engineer here for the firm.

Byers, largest producer of wrought iron, claims the new iron has greatly superior resistance against many kinds of corrosive forces, including

New Wrought Iron Produced

A new "4-D wrought iron" with 25 per cent increased corrosion resistance has been brought out of the laboratory and into production by the A. M. Byers Co., William E. Weber of Seattle, Byers field service engineer, said Sunday.

"Weber said 4-D wrought iron is immediately available

4-D PIPE — R. R. Kirkwood (left), Chief Mechanical Engineer for John Graham & Company, Seattle, checks piece of 4-D Wrought Iron Pipe now being produced by A. M. Byers Co. Looking on is Byers' Seattle Field Service Engineer, W. E. Weber.

A. M. Byers Claims Improved Wrought Iron Less Likely to Corrode

By a WALL STREET JOURNAL Staff Reporter

PITTSBURGH—A. M. Byers Co., a produc of wrought iron products, announced its mets lurgists have come up with a new and ir proved version of standard wrought iron.

Called 4-D wrought iron, simply a marketir term used to distinguish it from the standa product, it is expected to "aid substantially in reducing losses stemming from materi failures caused by corrosion, B. M. Myer president, stated.

He said that standard wrought iron is a ready "a bulwark in the fight against corr sion." Wrought iron pipe, for instance, is use in water, waste and drainage lines, locomotiv and diesel engine piping and underground air plane fueling lines, while flat rolled product go into coal chutes, bridge decking, pier pro tection plates, structural members and proces materials tanks.

A. S. Chalfant, vice president-sales, said th new product will go on the market immedi ately. He added that the new product will sel for the same prices as those for standard wrought iron.

A. M. Byers Announces Results Of Tests On New 4-D Wrought Iron

PITTSBURGH, Mar. 18. — Results of three tests new 4-D wrought iron have been announced by the etallurgical department of A. M. Byers Company, ttsburgh. The test data documents the announcement made by A. S. Chalfant, vice president of sales, a press conference in ttsburgh in February at new 4-D wrought iron at least 25% more corgion is characterized by agitation and plentiful oxygen."

Test Conditions

Byers Improves Its Wrought Iron

Special to World-Telegram and Sun.

PITTSBURGH, Feb. 12.—A. M. Byers Co., producers of wrought iron products, announced its metallurgists have found a new and improved version of standard wrought iron.

Called 4-D wrought iron, as a marketing term used to distinguish it from the standard product, it is expected to "aid substantially" in

Develop New Wrought Iron

PITTSBURGH, Feb. 1 . M. Byers Co., a produ rought iron products, ounced today its metallu ave come up with a ne nproved version of sta rought iron.

Called 4-D wrought mply a marketing term distinguish it from tandard product, it is exp "aid substantially" in r g losses stemming fro

A. M. Byers Co Develops New Wrought Iron

Dow-Jones Service

PITTSBURGH, PA., Feb. 12 A. M. Byers Company, produc of wrought iron products, nounced its metallurgists ha ome up with a new and proved version of stand rought iron.

Called 4-D wrought iron, sim a marketing term used to dis uish it from the standard pr ct, it is expected to aid s tantially in reducing los stemming from material failu sed by corrosion, B. M. M president, stated.

A. S. Chalfant, vice presid ales, said the new product go on the market immediat He added that the new prod

Civil Engineer C. E. Drummond (left), examines 4-D Wrought Iron sponge ball with J. A. Cain, A. M. Byers Company southeastern division manager. Laboratory test results have shown the new metal to be much

Developed By Byers

New Wrought Iron 25 Per Cent More Corrosion Resistan

250,000 Non-Rusting Fibers Per Square Inch In Product

By W. L. RUSSELL, Press Business Editor

Out of the laboratory and into production at Byers Co. has come a new type of wrought iron is credited with increasing corrosion resistan much as 25 per cent.

The new 4-D is a result of 17 years of resear

In addition to superior resistance to corrosio new iron has greater uniformity and improved physi mechanical properties.

This is attained by substantially increasing the

4-D WROUGHT IRON

M. Byers Co. Markets w Kind of Wrought Iron

BURGH (AP)—A. M. Byers on the market today a d of wrought iron de- s the most significant ent in the history of the

scription was given at a ference yesterday by B.

wrought iron, developed after 17 years of research, has greater uniformity and better physical and mechanical properties.

The key to manufacture of 4-D wrought iron is removal of more oxygen from the base metal--

A. M. BYERS DEVELOP NEW WROUGHT IRO

PITTSBURGH, Feb. 13—(DJ A. M. Byers, Co., a producer o wrought iron products, announced its metallurgists have come up with a new and improved version of standard wrought iron.

Called 4-D wrought iron, simply a marketing term used to distinguish it from the standard product, it is expected to "aid substantially" in reducing losses stemming from material failures caused

Corrosion Resistance Raised in Wrought Iron

PITTSBURGH, Feb. 15 (AP) The A. M. Byers Company has announced development of an improved type of wrought iron highly resistant to corrosion.

Known as 4-D wroug the product is the re seventeen years of r the company said.

B. M. Byers, preside the new wrought iron by removin from the base refined iron— purer state

'New' Wrought Iron Developed

Production by A. M. Byer Company, Pittsburgh, Pa of a new "4-D wrought iron with 25 per cent increase

A. M. BYERS DEVELOPS NEW WROUGHT IRON

A. M. Byers Co., a producer of wrought iron products, announced its metallurgists have come up with a new and improved version of standard wrought iron. Called 4-D wrought iron, simply

4-D Wrought Iron Cuts Corrosion

Out of the

Rykoskey, General Superintendent of Motive Baltimore & Ohio Railroad, gets a first hand from R. G. Angell (left), A. M. Byers Co. Railroad Manager, on the increased corrosion resistance 4-D Wrought Iron. Byers recently announced a mprovement in wrought iron which makes the t at least 25% more corrosion resistant than rd wrought iron. Railroads are among the world's users of corrosion resistant wrought iron.

Here is news. It's about one of the most significant metallurgical advances of modern times: the increased corrosion resistance of new 4-D Wrought Iron. This improved metal provides longer service life at lower cost per year. You can get further details from the Byers representative or by writing direct: A. M. Byers Company, Clark Building, Pittsburgh 22, Penna.

M. Byers Making New Wrought Iron

most significant development history of wrought iron — new 4-D wrought has just been announced . Byers Company.

press conference Tuesday in gh. B. M. Byers, president firm which is the world's producer of wrought iron told newsmen:

condensates.

According to E. P. Best, Byers chief metallurgist, the improved 4-D wrought iron was achieved by substantially increasing the deoxidation of the base metal; increasing the phosphorous content in relation to the other material components; and using fiberous material.

ought Iron More Resistant

wrought iron whose corrosion re- ce is increased 25% over standard ght iron is available. Marketed the name 4-D Wrought Iron, roduct is the result of 17 years search, laboratory and in-service

e improved wrought iron is made

uniform di fiber throug

Also bec the metal i standard wr mechanical

4-D wrou ing product

Placed

A. S. Chalfan ales, stated tha is simply a ma to distinguish th from standard w be placed on th ately and would the Byers Comp

ROUGHT IRON IMPROVEMENT IS REPORTED

Out of the laboratory and into production has come "new 4-D Wrought Iron" with 25% increased corrosion resistance, A. D. Sheere, A. M. Byers Co. Pacific Coast manager, announces.

Mr. Sheere, of San Franc recently returned from Pittsb where he was given a previe the new material. He says Wrought Iron is immediately able—at no increase in price- will save millions of dolla corrosion losses annually in Pacific Coast territory.

According to Mr. Sheere, 4-D Wrought Iron was achiev increasing the purity of the increasing its phosphorous co and using a more siliceous silicate. Wrought Iron is

New Wrought Iron Is 25 Per Cent More Corrosion Resistant

A new type of wrought iron, developed in the laboratories of A. N. Byers Co., Pittsburgh, is now in production. It is credited with increasing corrosion resistance as much as 25 per cent. The new metal, known as "4-D" is the result of 17 years

Byers Develops New Wrought Iron

PITTSBURGH, Feb. 13. — A. Byers Co., a producer of wrou iron products, states its me urgists have come up with a and improved version of stand wrought iron.

Called 4-D wrought iron, sim a marketing term used to di guish it from the standard p ort, it is expected to "aid subs tially" in reducing losses stemm material failures cau

Byers Improves Wrought Iron

Special to the Herald Tribune

PITTSBURGH, Feb. 12.—A. M. Byers Co. announced today that it had developed a new kind of wrought iron, shown by tests to offer "greatly superior resistance" to corrosion.

Called "4-D," the improved wrought iron was achieved by substantially increasing the deoxidation of the base metal; increasing the phosphorous content in relation to other com-

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FIRST IN SALES IN NORTH AMERICA BECAUSE:

EASY TO INSTALL
Three inlet openings and interchangeable mounting feet meet any installation requirement. Inducer may be mounted for either horizontal, vertical or angular discharge, and can serve one or more boilers.

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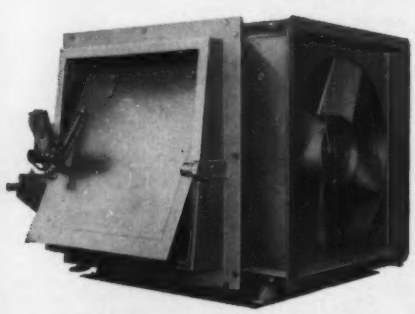
All welded steel fan wheel of airfoil design and non-overloading, low horsepower characteristics permit maximum, unrestricted gas flow of natural draft.

RUGGED CONSTRUCTION
Wing Draft Inducers are sturdily and compactly constructed for long, trouble-free life.

EXPLODED VIEW
showing inner assembly partially withdrawn.



Discharge end of Inducer showing optional barometric damper.

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Cost Less
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Cost Less
by eliminating
high stack maintenance costs.

Cut fuel costs and improve boiler operation by always providing the correct draft for complete, economical, safe, and smoke-free combustion.

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Eliminate tall, ugly stacks. Low stub stacks harmonize best with modern architecture.

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Entire fan and inner bearing assembly is easily withdrawn from the casing—out of the hot gas stream—when desired.

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Ideally suited for use in schools, churches, hospitals, etc.

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V-belt drive eliminates the need for field alignment. Belt tension is automatically maintained by a spring-loaded base.

PRECISE DRAFT CONTROL
Fan speeds are adjustable with either variable speed motors or with adjustable pitch sheaves and constant speed motors. Turbine drive also available.

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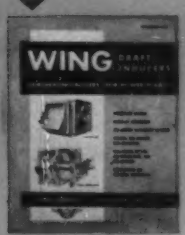
Thousands of successful installations. Standard with most boiler manufacturers.

For detailed information on how Wing Draft Inducers can give you lowered installed costs, lower fuel costs, and reliable operation, write for Bulletin I-58.



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The Word From Washington

EDGAR A. POE
Consulting Engineer Correspondent

IN A FAR-REACHING decision the U. S. Court of Appeals in the District of Columbia has affirmed a district court decision that corporations cannot qualify as professional engineers. The profession is limited, under this interpretation of a 1950 District of Columbia law, to individuals and partnerships. The effect of the ruling could be the reorganization of some 200 corporations in Washington which engage in some kind of engineering or consulting work. D.C. law similarly prohibits attorneys, physicians, and ministers from incorporating.

Atomic Ship

One of the most useful developments of atomic energy is the NS Savannah, a combination cargo-passenger nuclear ship. With an initial fuel loading the ship can run for three years without refueling. The 590-ft craft cruises at 20 knots and accommodates 60 passengers and 9400 tons of dry cargo.

The Maritime Administration says total cost of ship and reactor will be $31 million. The ship will be launched in late 1959, and the reactor will begin operating in 1960.

Helium Recovery

Interior Secretary Fred Seaton emphasizes the importance of the Department's policy to conserve helium, an irreplaceable natural resource found in only a few natural gas fields. Helium is vital to atomic energy, guided missiles, navy blimps, weather balloons, and defense programs.

As a first step Seaton suggests private business construct plants to recover helium. He advocates a dozen plants near fields that produce the gas, involving construction costs of about $250 million.

City Planning

Consulting engineers and planning officials of U. S. metropolitan areas are facing some of the toughest engineering problems of all time.

Philip M. Hauser of the University of Chicago, keynote speaker at the American Society of Planning Officials dinner in Washington, declared planners and engineers already are faced with roadblocks because of antiquated government setups. He said metropolitan area population may increase by 110 million to 145 million by the year 2000, totaling 200 million to 235 million. Today there are 168 standard metropolitan areas, according to the Bureau of the Census, and within these metropolitan areas are 16,000 governmental units with power to tax and spend.

Metropolitan communities have begun facing the problems. Some have created special authorities and districts, and consolidated governmental units, so they can plan for the whole area.

Atomic Electricity

The AEC and the Rural Cooperative Power Association of Elk River, Minnesota have agreed on construction of a $13-million nuclear power reactor to supply 22,000 kw to the cooperative. The AEC will ante up $11.4 million for the plant, while the RCPA will supply land plus $1.7 million for a conventional turbogenerator to use reactor-generated steam.

Congress has turned thumbs down on White House recommendations to revise the financing and loan structure of rural electric power cooperatives, thus removing subsidy features of REA.

Judging by letters to congressmen, more and more people believe that REA (as well as TVA) should stand on its own feet. REA Administrator David Hamilin acknowledges that REA affiliates face a curtailment in government financing.

President Eisenhower recommended that Congress reduce the lending power of REA and to require at least half the loan funds be obtained from private sources. He also suggested that the interest rate be raised to cover the cost the government pays to borrow money.

Other News

Some 900 new post offices in smaller communities will be under contract or construction by this fall.

The Pentagon is ready to spend $1.6 billion for new military public works construction. Some will be spent abroad, some for 58,600 new military housing units. ▲▲

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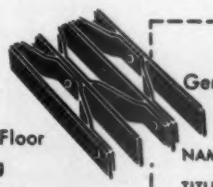

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Scraps & Shavings

WE WERE ENORMOUSLY pleased – and there was some personal pride involved, too – when we heard that the Consulting Engineers Council had been officially invited to become a member of FIDIC, (International Federation of Consulting Engineers).

It was less than three years ago in St. Louis, at the first meeting of a group of men representing 10 separate state or regional associations of consulting engineers (the 10 associations that later formed the Council) that we were asked to speak on the need for a national body representing only independent engineers in private practice. We extended the topic considerably and told the group about FIDIC and its work as an international society.

A year later, in Tulsa, at the Council's organization meeting, we again had a chance to address the delegates, and there we stressed the need for a constitution that would assure compliance with the requirements for membership in FIDIC. Quite naturally, at both of these meetings the delegates from the several state and regional associations were much more interested in national than international organization, but despite this, most members of the board of directors were farsighted enough to recognize the advantages to be gained through international cooperation. As a result, the Council's constitution and bylaws were written with the basic requirements of FIDIC in mind.

Meanwhile, the European officers and members of FIDIC knew almost nothing about the organization or operation of the new Consulting Engineers Council in the United States. In an attempt to change this we visited, in May 1956, five European countries and in each of them met the officers of their national associations of consulting engineers. We explained to them the concept of the embryo Council. We continued to keep these European engineers informed of Council activities by correspondence and by meetings with their members who visited the United States.

Then, when Ed Wolff became president of the Council, in May of last year, we encouraged him to establish a correspondence with Julian Tritton, of London, currently president of FIDIC. He did this, and in time there resulted an official invitation for the Council to send an observer to the annual meeting of FIDIC, held just a few weeks ago in Oslo. Wolff was appointed to act as the Council's observer, and he not only attended the Oslo meeting but also met individually with officers of associations in France, Holland, and Denmark, as well as with Mr. Tritton, in London.

It is obvious that Ed Wolff made a good impression on all of these engineers and that he also did an excellent job of explaining the organization and operation of the Council to the delegates of the 10 European associations at the Oslo meeting.

In his report to the board of directors, Wolff strongly recommended that the Council accept the FIDIC invitation and not only become a member but an active participant in the International Federation. He further recommended that the Council send two delegates to the next FIDIC annual meeting, which will be held in The Hague.

While this invitation is important to the Council, FIDIC, too, can greatly benefit from American participation. In the affairs of private practice, just as in affairs of state, no organization can consider itself fully international unless it has within its membership representation from the United States. There is no doubt but that U. S. affiliation will be mutually beneficial. For example, in FIDIC's dealings with the World Bank, ICF, and ECA, it will be of obvious advantage to have an official representative in the United States.

FIDIC also should be commended for inviting South Africa to join. If the South African Association also becomes a member, this will mean that FIDIC will have membership in three continents. It no longer will be solely European but will represent a solid segment of the consulting engineers of the world.

We cannot help being a little proud of our part in this important action of FIDIC and the consulting Engineers Council of the United States. We hope we have helped bring the consulting engineers of London, Paris, Berlin, and Springfield a little closer together. ▲▲

FILE REFERENCE

FACT SHEET

GRAVER®

How A Small Rural Community Solved Its Water Supply Problem

Dr. J. M. Brown, Village President
Arthur W. Robinson, Water Superintendent
Charles O. Herman, Village Clerk
Williams & Works
Consulting Engineers
Grand Rapids, Michigan
Raymond L. Elliott, Project Engineer
Graver Tank & Mfg. Co., Inc.
Design, Fabrication and Erection

Type: Double Ellipsoidal Elevated Tank
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Height to Overflow: 128'
Head Range: 28'
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THE PROBLEM

The water supply of the growing rural community of Berrien Springs, Michigan (population 1,761), was adequate for normal demands but insufficient for summer sprinkling and fire protection. Furthermore, in terms of expected population growth, the system—installed in 1914—was woefully limited. The old system would be required to meet a demand for over 2,000 gallons per minute while the capacity of the wells was limited to 1,500 gallons per minute.

THE SOLUTION

An enlarged storage supply was the answer. The purchase of a new elevated water tank of 150,000 gallons capacity to replace the existing 50,000 gallon tank was recommended. Without increasing the present pumping capacity, the larger tank provided enough storage to meet the demand of over 2,000 gallons per minute for a five hour peak period. This also assured the needed water to protect the community from fire.

Graver was selected to design, fabricate and erect the 150,000 gallon elevated water tank and to paint, sterilize, light and cathodically protect it before completion. Graver also dismantled and removed the old tank.

The teamwork between the Village officials, the Water Superintendent, and consulting engineers and Graver resulted in an excellent solution to the need for additional water at the lowest cost.

Water storage and pressure problems are being solved regularly by villages and cities across the country with Graver's help. Graver's experience of over a hundred years with tank fabrication and erection contributes directly to the solution of these problems, through conferences with a consulting engineer and with Graver.

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BUILDING FOR THE FUTURE ON A CENTURY OF CRAFTSMANSHIP IN STEELS AND ALLOYS

The Legal Aspect

MELVIN NORD, P.E.
Consultant in Legal and Technical Problems
Patent Attorney

Original Aquisition of Ownership of Real Property

WHEN ONE ACQUIRES title to real property, he usually gets a "derivative" title; that is, he succeeds to the title of his predecessor. However, there obviously also must be some way to acquire "original" title — title which is not derived from a predecessor.

In International Law, a country acquires sovereignty over newly discovered territory by occupation; that is, by possession. In personal property law, a person can acquire original title over an unowned chattel (such as, for example, a wild animal) by taking possession. It is a general rule of law that ownership of property consists of possession, with the intent to exclude others.

Original Title

Thus the crux of any original title is taking possession, with that intent to exclude. If the property has never been owned by anyone else, such original title is the first title.

However, it is also possible for an original title to be acquired which is not the first title, provided it is not derived from a prior title. An example is when an abandoned chattel is possessed by a finder, with the intent to exclude others. The new possessor then immediately becomes the owner of the chattel. His title is original, since it is independent of the prior title. There is in this instance, so to speak, a "gap" in the title. The old chain of title has terminated. It has been followed by a period during which no one owned the chattel. Subsequently, a new and independent chain of title has originated. (The doctrine of "abandonment," however, applies only to personal property, and not to real property.)

There is also another way in which an original title to property can be acquired, which is not the first title; i.e., where the new title destroys the prior title. Here there is no gap, but there is a break in the chain of titles. Sometimes this may be the result when there is a tax sale, but usually the purchaser at a tax sale simply gets a derivative title.

Adverse Possession

The principal example of an original title which arises upon the destruction of the title of another is title derived by adverse possession. We already have seen that a person who possesses unowned property with intent to exclude others immediately becomes the owner. However, if the property already is owned by someone, it is not quite that easy. Possession by someone other than the owner, without his permission, is a tort, or civil wrong. Therefore, it is obvious that the law would not be so foolish as to reward the wrongdoer with title just because he has taken possession and intends to keep others out. Might does not make right — at least not quite.

However, suppose this possession continues for a long time, without any action by the owner. The law cannot wait forever, and if the owner does nothing during the period provided in the Statute of Limitations for the recovery of possession of real property (generally 20 years), he is barred thereafter from bringing such action. Furthermore, he is no longer legally entitled to be regarded as the owner, and the adverse possessor now is legally entitled to be regarded as the owner. The wrongdoing is entirely wiped out, and the law now will indulge in the fiction that his original taking of possession was lawful (as if the property had been granted to him by the prior owner, or as if the owner had originally abandoned his rights). There is thus no gap in the chain of title, but merely a break in it; and the break now is regarded as having

occurred 20 years ago. In short, there is a complete legal whitewash, but it is delayed for 20 years (15 years, in some jurisdictions).

How can one acquire a right by committing a wrong? Answer: By persisting in it for 20 years!

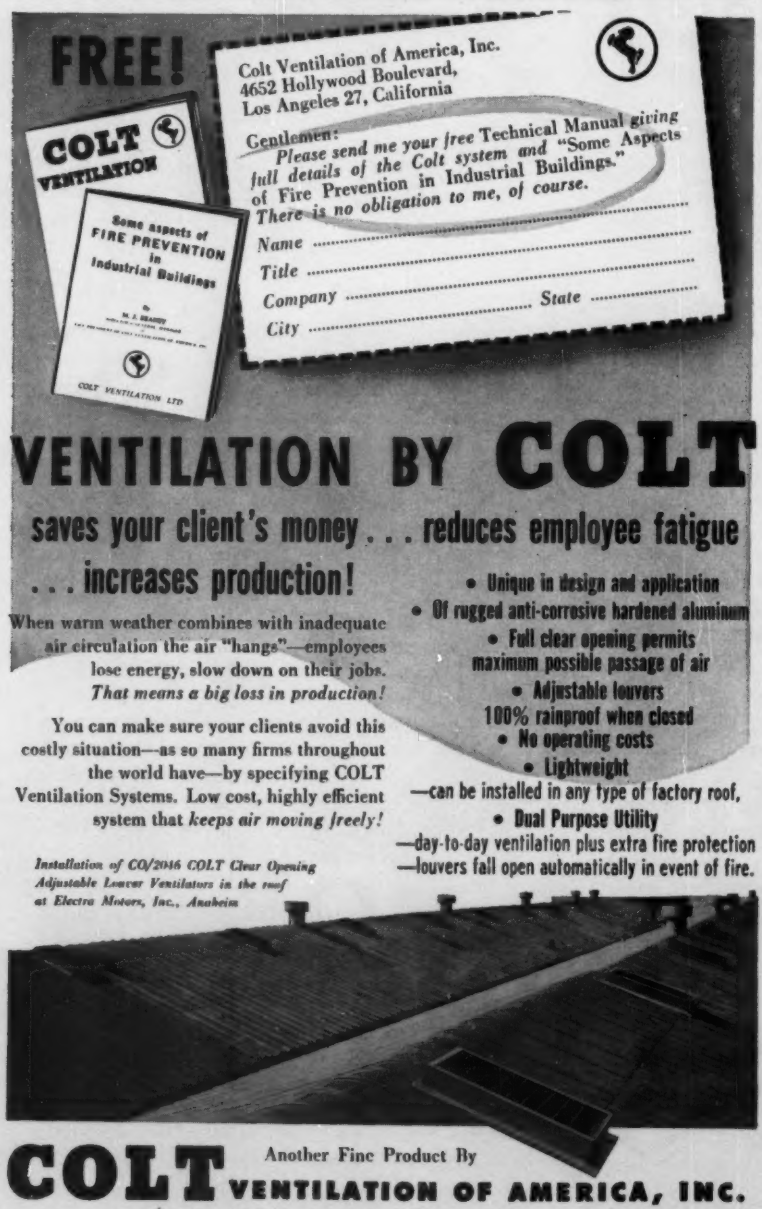
Adverse Possession Requirements

The basic requirements to make out title to property by adverse possession are as follows: the possession must be "hostile" and "under a claim of title;" it must be "open and notorious;" and it must be "continuous" for the statutory period.

Hostile. When it is said that the adverse possession must be hostile, all that is meant is that it is not in subordination to the actual owner's rights. "Under claim of title" means substantially the same thing. It does not necessarily mean that the adverse possessor claims a right to be in possession as owner, but simply that he acts as if he were the owner rather than as someone present by permission, such as a tenant or licensee.

Open and Notorious. The requirement that the possession be open and notorious rather than secret is very important as applied to personal property, but is not generally as important for real property, since there is usually no way to hide possession of realty (unless the possession is subterranean.) The purpose of this requirement is to give the actual owner a fair opportunity to find out about the possibility of his losing his title by adverse possession. However, it is not necessary that he have actual knowledge of the adverse possession; it is sufficient only that the adverse possessor commit acts which are sufficiently open to be known by the community.

Continuous Possession. The adverse possession must continue uninterruptedly for the statutory period of time (disregarding interruptions which are inherent in the nature of the land; e.g., caused by floods). If it is interrupted, the new possession must continue for the full statutory period. If adverse possessor A purports to sell his interest in the land to B before the statutory period has been completed, B's subsequent period of adverse possession can be added to A's possession to make up the full period. But the rule is contrary if B does not purport to derive his "title" from A. The statutory period will not start running in favor of a tenant against his landlord after the lease expires, unless the tenant makes it clear to the landlord that he is claiming title, and is not staying on in subjection to the rights of the landlord. The situation is similar to the relation between two or more joint owners, one of whom attempts to oust the other. The statutory period also does not start to run if the actual owner was under one of several "disabilities" at the inception of the adverse possession; e.g., minority, insanity, or imprisonment. However, disability which intervenes after the incep-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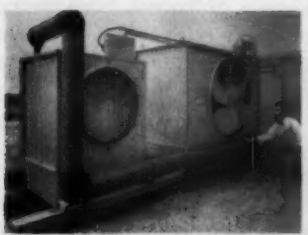
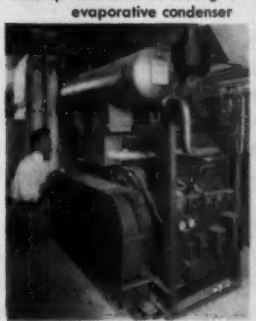
Comfort made possible by COMPACT DUNHAM-BUSH EQUIPMENT



Rooftop installation of cooling tower and evaporative condenser

Low temp 'ED' electric defrost unit in walk-in cooler



'PC' 40 ton Heat-X package chiller for water chilling

Brunner-metic condensing units in rack assemblies

The matchless combination of engineered compact design and high performance efficiency—that's why Dunham-Bush was selected to serve the eight Savarin restaurants on the new Connecticut Thruway.

The single major problem at each of these eight locations was how to get maximum floor space to accommodate the many travelers, and yet have the kind of equipment necessary to insure complete customer comfort. A solution was sought . . . Dunham-Bush was selected.

Units of the following types are installed at each of the new eating places . . . for complete atmospheric comfort and proper food and drink conditioning: Packaged Water Chillers, Unit Coolers, Evaporative Condensers—all with patented Inner-Fin construction that permits compactness of design previously impossible; Air Handling units, Oil Separator Mufflers, and Rack Assembled Condensing units (for extra space-saving convenience).

Depend on Dunham-Bush, the single, compact organization that has the product depth, diversity, and experience to satisfy every demand for heating, air conditioning and refrigeration equipment.

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Full skids for easy positioning

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Choice of components

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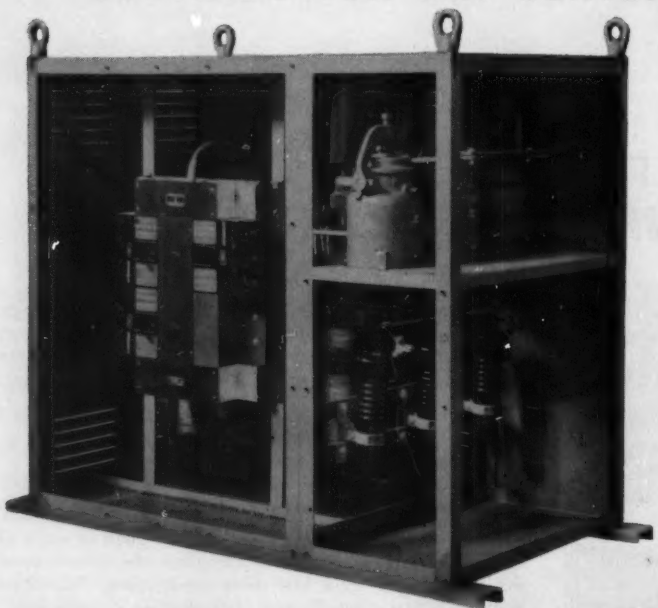
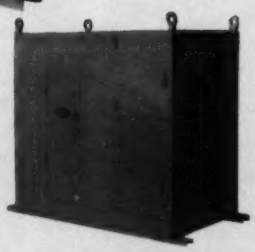
DISTRIBUTION UNI-CENTER



New Standard DISTRIBUTION UNI-CENTERS combine incoming line, transformer and outgoing feeder in one compact unit. The 112.5 KVA, three phase, 4160 to 280y/120 is just 63½" high, 74" long and 38" deep. The high voltage section is equipped with three 3 KV lightning arresters and gang operated, oil fused cutouts. The low voltage section has 3-pole, thermal magnetic case circuit breakers. The unit is shipped, handled and installed in one piece. The Standard DISTRIBUTION UNI-CENTER is available in any KVA rating and to and including 4800 V.



*Standard LO-TEMP transformers provide extra capacity at no extra cost.

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"WHEREVER THERE IS POWER"

tion of adverse possession does not stop the continuance of the statutory period.

Constructive Adverse Possession

While it always is said that the adverse possession must be "actual," there is also a limited doctrine of "constructive" adverse possession.

Under this doctrine, if an adverse possessor is in actual possession of part of an area of land, he can acquire title to the remainder, under the following circumstances:

¶ If he asserts a good-faith claim of title to the entire area

¶ If the part occupied represents a reasonable portion of the entire area, insofar as size and use are concerned

¶ If he has "color of title" to the entire area (a writing which is actually ineffective legally, but which the holder believes to be effective)

Limitations on the Title

The title acquired by an adverse possessor cannot exceed that title which he has been claiming. For example, if he has been claiming only a life estate (the remainder to remain with the original owner), he gets only a life estate.

Furthermore, the adverse possessor's title is, as a general rule, also limited to that originally owned by the prior owner. That is, the adverse possession normally is wrongful only against a person who was in possession or entitled to possession. It is not wrongful (and hence not effective) insofar as the rights of a future possessor are concerned. The crux of the problem is always whether the adverse possessor has continued in possession for the statutory period, in spite of the right of another to maintain a legal action to recover possession. If the other could not have maintained such an action, he obviously cannot be barred by the Statute of Limitations.

Thus, it sometimes turns out that the adverse possessor acquires a lesser title than claimed. It is never larger; it can be smaller.▲▲

PVC PIPING NEWS

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KEY TO BIG COST CUTS

Users report UPVC piping slashes first costs, stops maintenance

Plants, large and small, are switching to unplasticized polyvinyl chloride (UPVC) piping for corrosive services to make these important savings in first costs and in operating costs:

Lower materials costs. UPVC piping materials cost substantially less than metals, alloys or lined material commonly used in the same services.

Lower installation costs. It can be erected easily and quickly. Widely used socket type joint can be made in about a minute with solvent cement and a brush. Threaded type joint also easily made. UPVC piping is easy to handle . . . weighs ½ to ⅙ as much as metal piping. It does not have to be painted.

Lower maintenance costs. Users report drastic cost reductions through elimination of piping corrosion, protection against fluid contamination and stopping of galvanic or electrolytic action.

For top quality... specify industry's leading line

The ttp line of injection molded UPVC fittings, flanges, valves, solvent cement and thread lubricant is available nearby from your Tube Turns Plastics' Distributor. He can supply *all* your needs on one order and can help you with design and installation data. Write us for the complete line catalog, Bulletin 119.

More and more engineers specify UPVC with socket type joints and ttp fittings to cut installation costs.

Every ttp fitting is fully identified . . . even with a quality control code number . . . to guard your reputation.

Your nearby distributor of ttp products can serve you quickly from the industry's most complete line. Above: At Hajoca Corporation, Chester, Pennsylvania.

Leading Manufacturer of Injection Molded Unplasticized Polyvinyl Chloride Pipe Fittings, Flanges and Valves

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Detroit, Michigan
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Los Angeles, California
UNION PACIFIC RAILROAD
Denver and Omaha
NEW YORK CENTRAL RAILROAD
LaSalle Street Station, Chicago
HOMESTAKE-SAPIN URANIUM MILL
Grants, New Mexico
UTAH CONCRETE PIPE CO.
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AMERICAN ROCKWOOL CORP.
Wabash, Indiana
GREAT NORTHERN RAILWAY CO.
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BELL AIRCRAFT CORP.
Tonawanda, New York
REMINGTON RAND
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BURGESS BATTERY COMPANY
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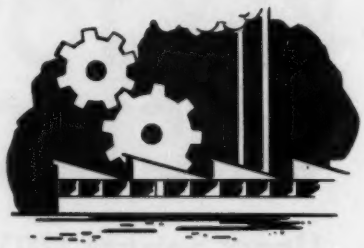

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TOPEKA STATE HOSPITAL
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CITY OF BROOKINGS
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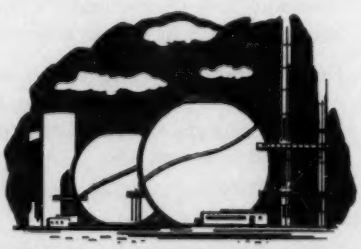

FOOD PROCESSING

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CALIFORNIA WALNUT GROWERS ASSN.
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SPENCER PACKING CO.
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LAND O' LAKES CREAMERIES, INC.
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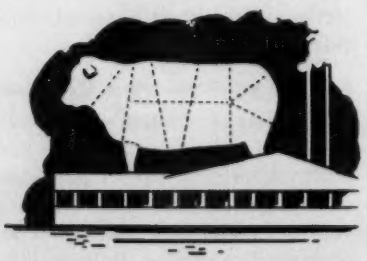
DAIRY MAID CO-OP CREAMERY
Augusta, Wisconsin
MORTON FOODS
Dallas, Texas
BLUE-STAR PRODUCE CO.
Omaha, Nebraska



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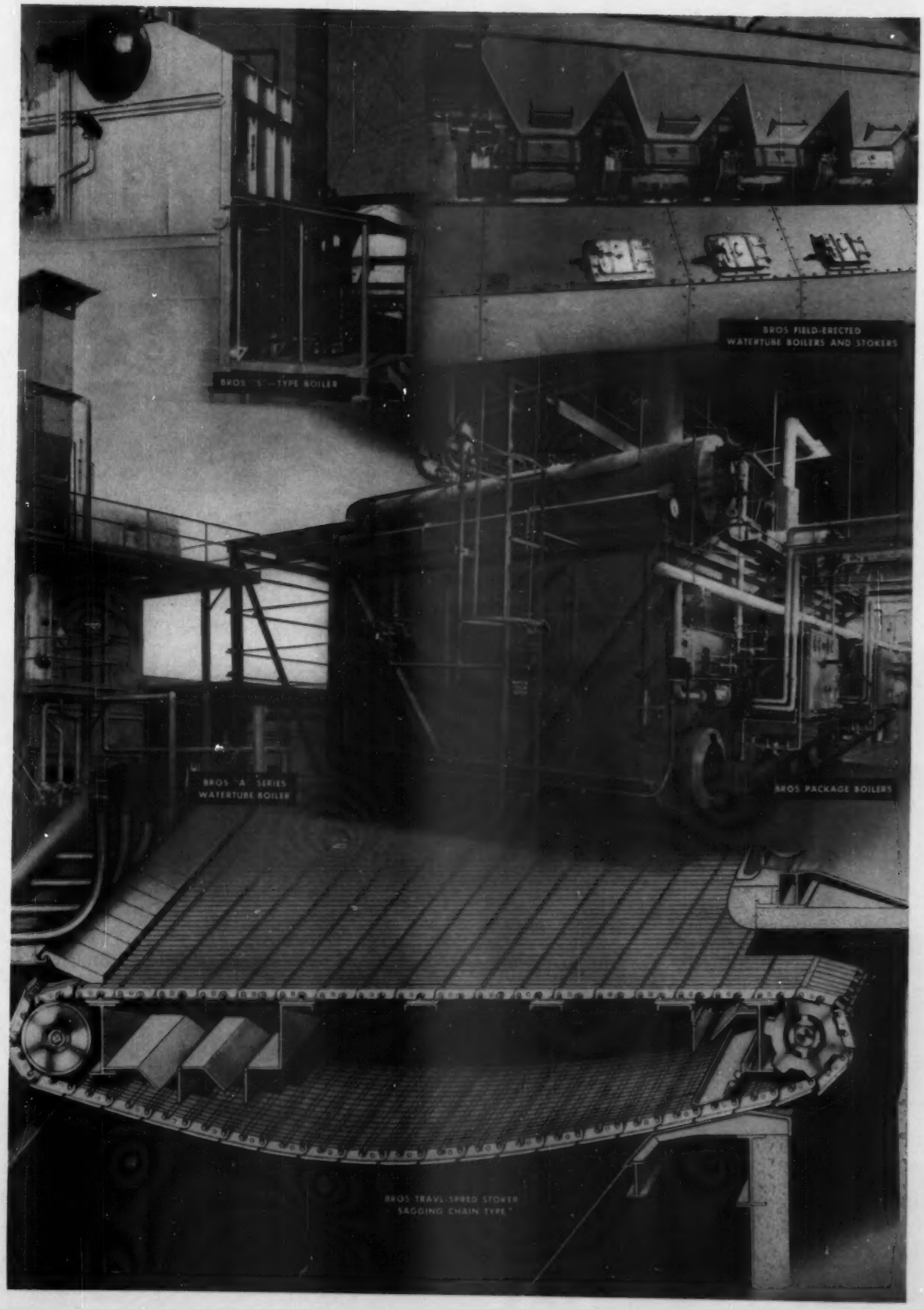
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SAGGING CHAIN TYPE

Report from the West Coast

RALPH S. TORGERSON
Consulting Engineer Correspondent

THE SECOND ANNUAL convention of the Consulting Engineers Council, marked by active participation of the 21 state and regional consulting engineer groups represented, revealed important gains both in growth and prestige for the young organization. The meeting was in San Francisco, with the Consulting Engineers Association of California as host.

The Executive Committee met in an all-day session on April 30, preceding the directors' meetings from May 1 through May 3.

New groups added to the Council were the Consulting Engineers Association of Michigan and the Houston Chapter, Texas Association of Consulting Engineers. John R. Snell, president and director of the Michigan Association, was officially seated with full rights as a member of the board.

President Edward J. Wolff, in his convention report, listed seven major accomplishments of CEC during the past year:

¶ Establishment of a central office with full-time executive secretary and staff

¶ Incorporation of CEC in the State of Louisiana

¶ Increase in membership to 21 groups

¶ Initiation of contacts in Washington, D. C. with various government agencies

¶ 20 working committees solving industry problems

¶ Work started on a Council Yearbook

¶ First step taken toward affiliation with FIDIC (International Federation of Consulting Engineers) with attendance at the Oslo, Norway meeting by President Wolff as an observer

Brief reports also were made by Charles Pate, first vice president; George Poulsen, second vice president; L. K. Crawford, secretary; and B. M. Dornblatt, treasurer. The following recommendations were made in the secretary's report:

¶ Retain the CEC office in Springfield, Ill. for one more year, and then move to Washington, D. C.

¶ Publish a 1958-59 Yearbook to contain a list of member associations with officers

¶ Publish a list of CEC officers with addresses and telephone numbers, and a committee roster with

CEC officers and board of directors attending San Francisco convention. Guests are standing in background.

ARCHITECTS and ENGINEERS: Skidmore, Owings & Merrill
GENERAL CONTRACTORS: Chell and Anderson
HEATING and PROCESS PIPING: Wm. A. Pope Co.
AIR CONDITIONING and VENTILATION: Cicero Sheet Metal Co.

Efficient Manufacture Employee Well-being

both aided by Clarage "air" in new Avon cosmetics plant

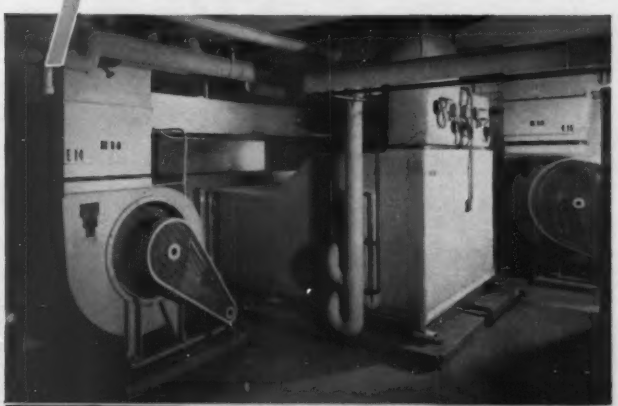
Here is much more than a thoroughly modern manufacturing facility. Here is a national sales center as well.

It's the new Avon Products, Inc., plant at Morton Grove, Illinois. From it flow the widely popular Avon cosmetic products. To it come members of Avon's door-to-door sales organization for training and sales meetings.

Air conditioning, thus, has a dual role to play in this structure — for employee comfort and for efficient manufacturing processes.

As for so many other noteworthy buildings, Clarage equipment was selected — some of which is shown on the right. On the job are Clarage Ready Unit ventilating sets, system fans, and Multitherm air conditioning units, including the famous Blow-Thru units pioneered and perfected by Clarage for multi-zone service.

You, too, will find it profitable to specify Clarage for your next assignments — no matter how large, how small. CLARAGE FAN COMPANY, Kalamazoo, Michigan.



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. . . dependable equipment for making air your servant

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objectives, duties, rules of procedure, policy statements, definitions, and a code of ethics

It also was recommended that a separate roster of all association members should be maintained at the Council office, and this would be made available to qualified people upon request.

Barney Dornblatt, treasurer, reported a balance of nearly $6000, with $4700 earmarked for expenditure during the Council's 1958-59 fiscal year.

Despite the very full agenda, some frank and spirited discussion developed over several of the committee reports. The net result was some very forthright action by the directors.

Ethical Practice

Joe Williamson, Jr. presented the important ethical practice committee report, which made a number of significant recommendations to the board of directors.

¶ The CEC ethical practice committee with concurrence of the executive committee be given the power to act at any time in the name of the CEC without prior approval of the board of directors

¶ A campaign of education, starting with a CEC School of Engineering Ethics and featuring a series of "lessons." Each lesson is to be prepared, if possible, by a nationally known consulting engineer.

¶ A statement of policy on finder's fees, pay-offs, kickbacks, commissions, and split fees:

"A consulting engineer shall not share fees except with other registered professional engineers or registered architects. In no case shall so-called split fees, finder's fees, commissions, kickbacks, or other benefits be condoned. It is to be understood, however, that interprofessional practice, for example with architects on the basis of any recognized ethical contractual basis, is approved. Furthermore, in soliciting work, a consulting engineer shall be represented only by those individuals regularly employed by or known to be associated with his office."

The report and statement of policy was unanimously approved. Included in this report was a statement by president-elect Charles Pate outlining the problem of free engineering with respect to manufacturers, and calling attention to the prevalence of kickbacks, commissions, and finder's fees, particularly in state and Federal works projects and contracts.

Errors and Omissions Insurance

Barney Dornblatt presented the professional report of Howard Eckerlin. Only the errors and omissions insurance portion of this report was given consideration. He suggested that all E&O insurance applications be made through the Springfield, Ill. office and then negotiated with the H. C. Hauth Company agency

West Ridge School, Greece, N.Y. ● Architect: Benedict Ade—Rochester
Consulting Engineer: Robson & Woese, Inc.,—Rochester

thanks to a SPENCER VACUSLOT® system

Positive sanitation and economy of maintenance were *planned into* this modern new school.

A Spencer Vacuslot system, with vacuum producer and dirt separator in the utility room and piping to inlet valves throughout the building, makes possible *quick, thorough* cleaning.

For routine maintenance of corridors and classrooms, large dry mops are used to push dirt and litter to the Vacuslot, where powerful vacuum whisks it away. Dry mops are then *vacuum* cleaned simply by passing back and forth across the Vacuslot.

This versatile system is also used for conventional vacuum cleaning, eraser cleaning, water pick-up (in conjunction with a portable wet separator) and for boiler tube cleaning.

If you're interested in built-in, cost cutting convenience and the positive sanitation that only *vacuum* cleaning can provide, it will pay to check with Spencer.

For Complete Information, Request
• Descriptive Bulletin No. 153C
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Also manufacturers of a complete line of portable vacuum cleaners.

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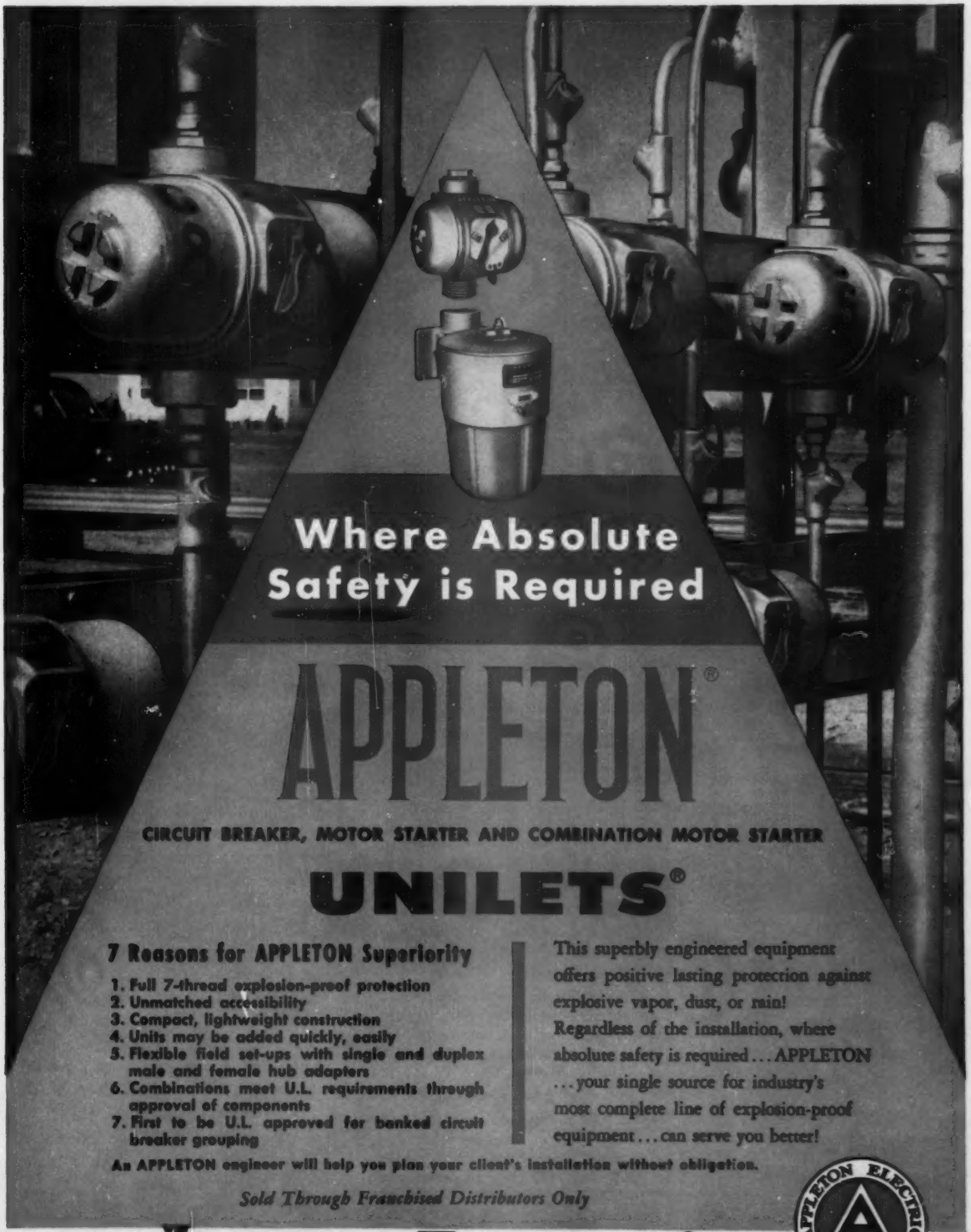

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1. Full 7-thread explosion-proof protection
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This superbly engineered equipment offers positive lasting protection against explosive vapor, dust, or rain! Regardless of the installation, where absolute safety is required... APPLETON ...your single source for industry's most complete line of explosion-proof equipment... can serve you better!

An APPLETON engineer will help you plan your client's installation without obligation.

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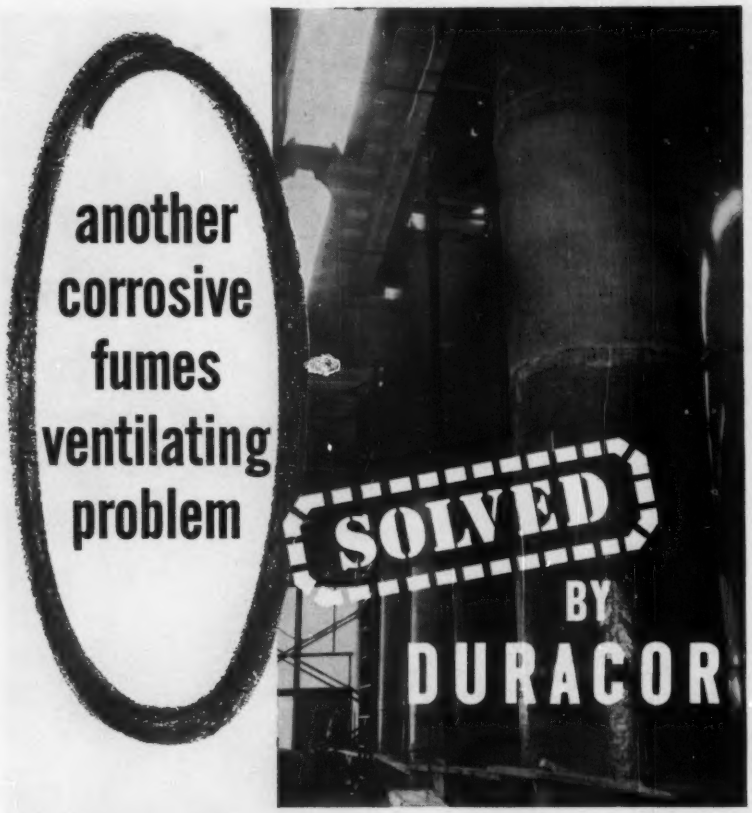
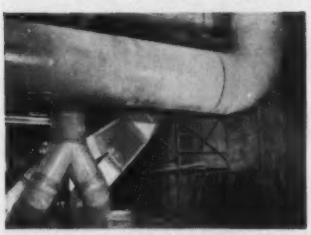
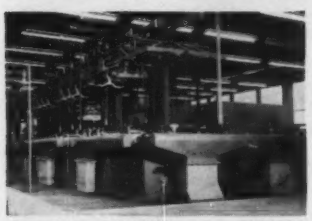


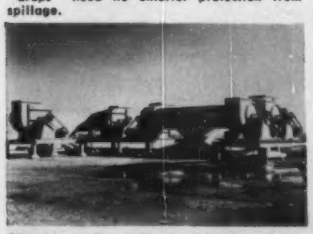
Duracor Ventilation System exhausts 250,000 C.F.M. of corrosive fumes from large electronic equipment plant.



Strong, lightweight DURACOR ducts over 5 feet in diameter require minimum support.



Corrosion-proof throughout, these DURACOR "drops" need no exterior protection from spillage.



Weather and corrosion resistance are provided by DURACOR "T" sections on roof.

PROBLEM: This ventilating system had to withstand sulphuric, nitric, chromic, phosphoric acid and cyanide fumes emitted from the plant's plating and anodizing operation.

SOLUTION: Working from customer specifications, Ceilcote engineers built the entire ventilating system shown here completely from DURACOR.

INSTALLATION: Experienced Ceilcote supervisors and crews handled the complete installation under one contract. Materials and workmanship are fully guaranteed.

WHAT'S YOUR PROBLEM? . . . DURACOR resists any corrosive gas, fume or liquid . . . can be fabricated to virtually any shape. Write today and tell us about your requirements.

DURACOR CEILCOTE 8019-CC

THE CEILCOTE COMPANY, INC.

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after a rate has been established. It was suggested that the committee be discharged from further consideration of E&O insurance. However, John K. M. Pryke, of New York City, suggested the action should be deferred so that the committee could be available for any future action. T. E. Roche of Minnesota told about the permanent committee on E&O insurance set up in his association.

Membership

The Membership Committee's report by Hueston M. Smith, of Missouri, emphasized the need for an increase in the budget allocation of funds for a concentrated membership drive.

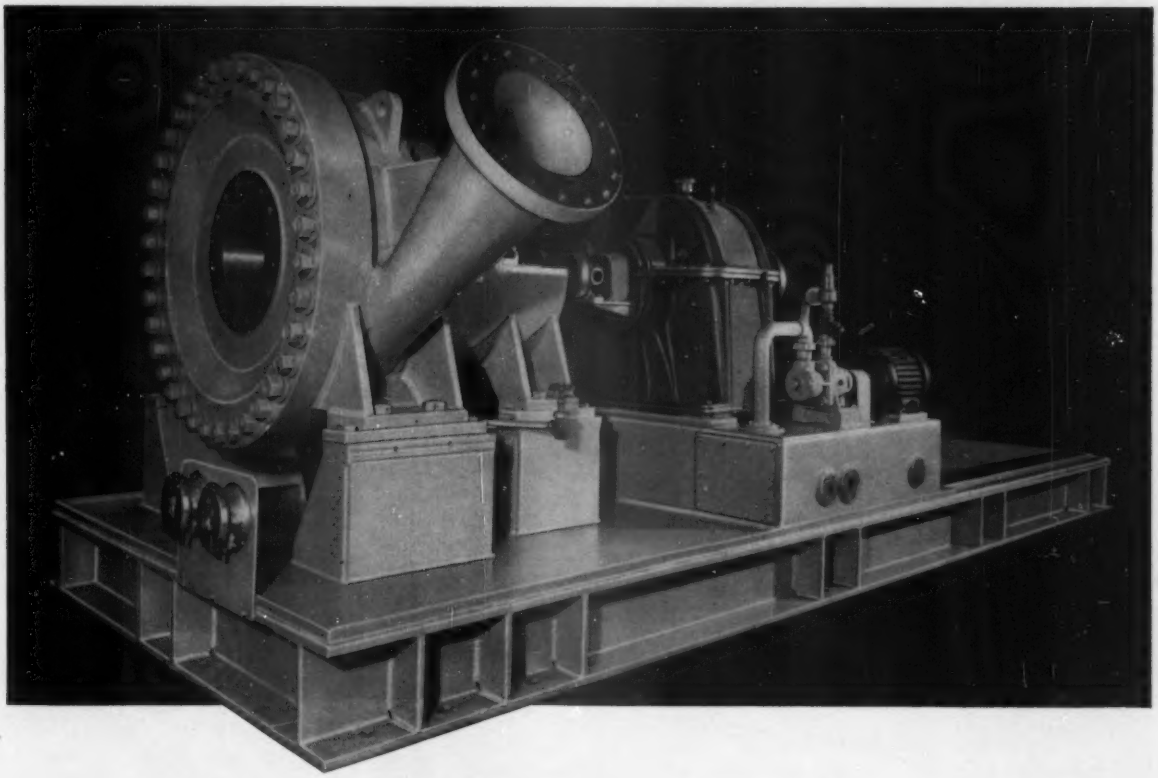
The report indicated the possible affiliation with CEC of the Consulting Engineers Council of Maryland, Practicing Engineers and Surveyors of Wyoming, Arizona Consulting Engineers Association, and South Carolina Association of Consulting Engineers. Two newly formed groups, the Consulting Engineers of Indiana, and the Consulting Engineers Council of Metropolitan Washington, D. C., also were listed as prospects for CEC membership. Kansas, Kentucky, Ohio, Idaho, New Jersey, North Carolina, and Pennsylvania have started or are considering the formation of state or regional associations which would be eligible for CEC membership.

Smith proposed that members-at-large be accepted in states where a state organization has not been started. Pennsylvania was cited as a particular example. The question of members-at-large was referred to the resolutions committee which later recommended:

¶ A membership-at-large classification for CEC be adopted in principle for certain areas

¶ Such membership be limited to consulting engineers residing in areas where no state, regional, or similarly constituted associations of consulting engineers exist

¶ Election of such membership to



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Single-Stage Barrel-Type
Allis-Chalmers Compressor

Boosts High Pressure Gas to Higher Pressure Levels in Range of 50 to 500 psia.

THIS new Allis-Chalmers development extends the range of single-stage compressors into high pressure levels previously handled by reciprocating type units.

The new compressor has all the advantages of a centrifugal compressor — compactness, pulsation-free operation, few wearing parts, easy maintenance.

The unit shown above, now in successful operation, boosts 3690 cfm of air from an inlet pressure of 185 psia to a discharge pressure of 240 psia. It is driven through a speed-up gear by an Allis-Chalmers 1250-hp motor.

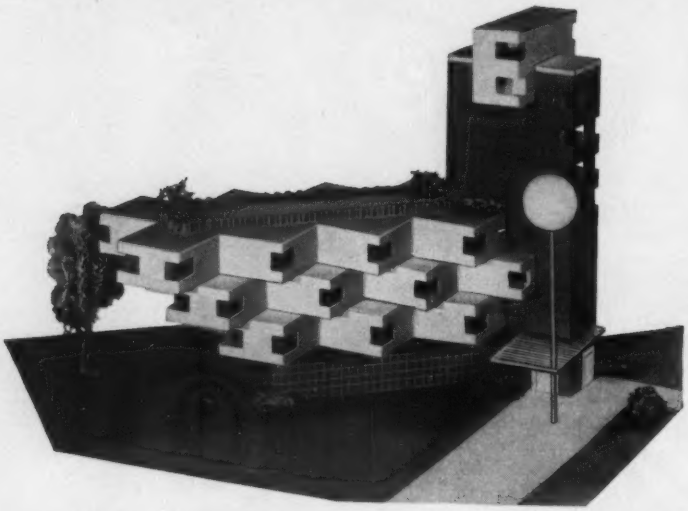
The casing consists of three principal parts: the casing cylinder, a bolted casing head and a fabricated casing pedestal. A diaphragm which forms the gas diffuser passage is inserted into the casing cylinder. Excellent gas sealing is assured, since there is only one shaft extension and only one casing joint to seal against gas pressure.

For details, including a sectional view of this new compressor, call your nearby A-C representative, or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-5728

Consultants Data File . . . one of an interminable series



NEW BUILDING HAS ALL CORNER OFFICES . . . LIKE AN AD AGENCY SHOULD

special electrical system devised for BRDT & OH

Confronted with the problem of a nagging need to make everyone happy with a corner office, the architect designed the face-saving arrangement shown above.

But the new building presented many challenging electrical problems, and Consultant Gregg Flannel was called in to solve them. Chief among his troubles: high ambient temperatures in the window-less, core-located conference room. Flannel wisely reckoned that the meeting room would be subjected to an excess of hot air, especially after dark . . . just when lighting loads would be at a peak. To assure safe continuity of electrical service under such trying conditions, Flannel cleverly specified Heinemann circuit breakers.

How come Heinemann? Well, Flannel knew that the Heinemann hydraulic-magnetic circuit breaker gives temperature-stable performance anywhere; trip points and current capacity are completely unaffected by ambient conditions. "No other circuit breaker," says Flannel, "could make that statement."

Be the first on your block to have a copy of Heinemann's brand-new Bulletin 3103. It's filled with enlightening facts on branch circuit protection.

S.A. 1417

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Circuit breakers

be by unanimous vote of the board of directors

¶ Admission fee and annual dues shall be in accordance with directives established by the board of directors

¶ Membership-at-large to be on a yearly basis and reviewed by the board of directors at each annual meeting

John Pryke said that every member should be an ex-officio member of the membership committee. Leo Landauer of Dallas, Texas, suggested a brief story be prepared on the functions, purposes, and advantages of being a CEC member for use in the membership drive.

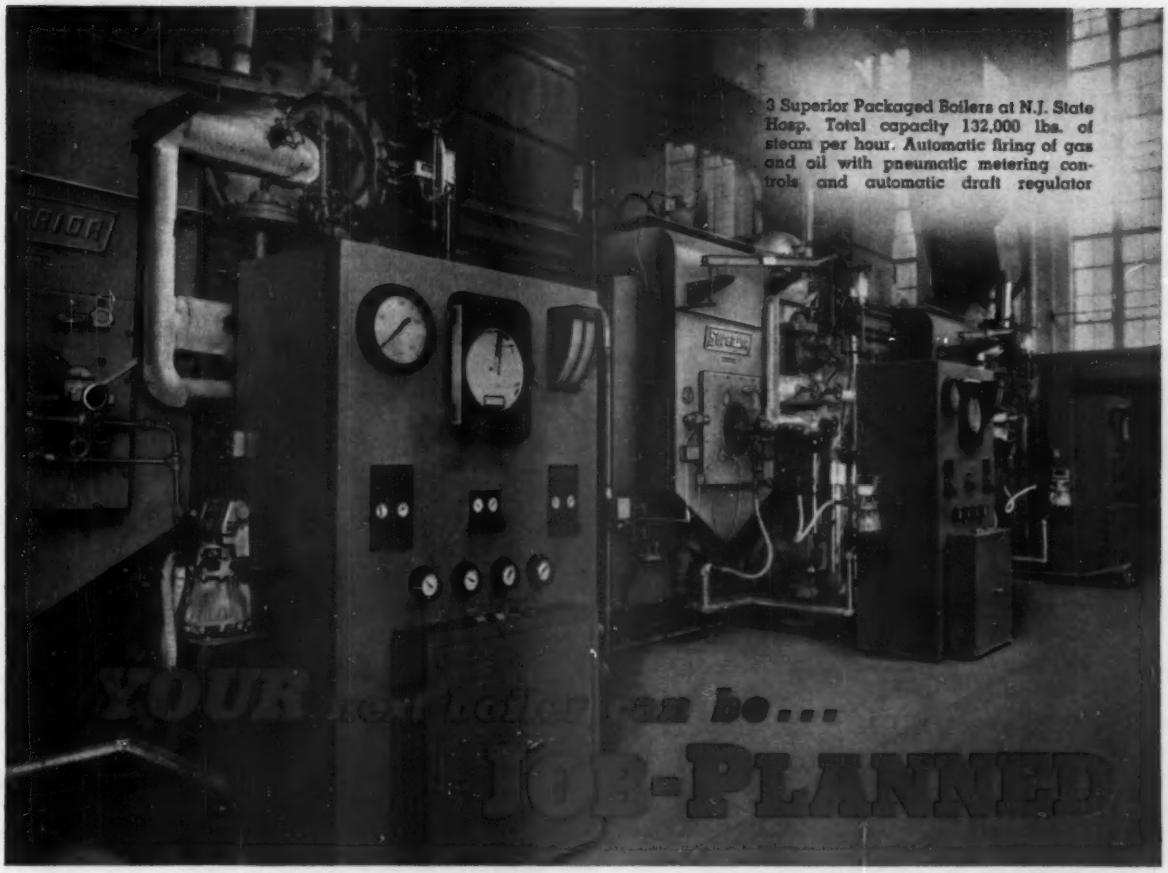
Contractors Engaged in Engineering

William W. Moore, of Dames & Moore, presented a report on engineering services by contractors. This report dealt with free engineering, package deals, and demands on contractors to supply more engineering services. L. K. Crawford told about some toll road problems in Illinois where contractors are required to do work which normally would be considered engineering. A questionnaire was proposed which might bring out details of these practices.

Package Deals

W. O. Stevens, of Washington, presented the report of the package deals committee. This report indicated that writing to offending manufacturers about package deals had been helpful in cutting down the practice, but a lot of publicity and missionary work will be required to convince manufacturers that package deals should be outlawed. The committee's report advocated the enactment of legislation in the various states establishing the supplemental licensing and registration of consulting engineers as a means of not only combating package deals but also of solving corporate practice problems.

A suggested amendment to the Washington State Professional En-



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Capacities to 50,000 lbs. per hour.
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All this with undivided responsibility, guaranteed performance and efficiency for minimum maintenance.

Why not choose your "guaranteed" packaged boiler to meet the needs of your job, just as you would when specifying a field-erected plant, and still get the advantages of factory assembly, factory-fire-testing, and most important, undivided responsibility?

The Superior Packaged Boilers pictured here are "job-planned" units incorporating burner and control equipment as specified by the purchaser, and tested at actual working conditions before shipment.

Testing involves all functional equipment: forced draft fan, burner, combustion controls, programming equipment, etc., mounted or connected to the boiler, thus providing a guaranteed product with undivided responsibility. Why settle for less? Why purchase half a package? For details write for Catalog 1007-W.

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WORM AND GEAR DESIGN ELIMINATES LOAD BRAKE ADJUSTMENT AND MAINTENANCE IN THIS

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CONCO "CRB" OVERHEAD ELECTRIC TRAVELING CRANE installed in municipal sewage disposal plant.

A feature of this Conco "CR" series crane is a worm and gear mechanical load brake which provides maximum safety, lower first cost, and the elimination of any adjustment or service needs. The brake offers a virtually limitless service life. It has only 2 moving parts. Conco "CR" cranes are one of many types custom-built for all classes of service. To engineers Conco offers two important facilities: A plant flexibility that permits true custom-building at a practical cost. And, a staff qualified by 50 years experience to provide such design assistance as you may request. May we submit specification data, an estimate, or a proposal on your next crane requirement? Write for Bulletin 5000A.

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gineers Act, written by the secretary of the Seattle chapter of the WSPE, was cited in this report as a means of correcting the problem. The amendment reads, "It shall be unlawful for a firm, co-partnership, joint venture, corporation, or joint stock association to render professional engineering services to the general public including governmental agencies if such firm, co-partnership, joint venture, corporation, or joint stock association is engaged, offers to engage, or is authorized to engage in commercial activity." Chairman Stevens has worked on package deal problems locally with WSPE, the state licensing department, and the AIA.

Free Engineering

Larry Spiller, executive secretary, presented the report on free engineering. Advertisements offering free engineering were investigated and action taken to inform the offenders of the CEC position. He mentioned a number of manufacturers whose advertisements had been objectionable and who had agreed to eliminate this type of advertising. CEC members were requested to watch for such advertising and report it to the Council.

Thomas Miles reported efforts in Oregon to get into law a prohibition of free engineering had been unsuccessful because the bill had been watered down until it would be ineffective. It was recommended that a standing committee of CEC be set up to meet with manufacturers and instruct them concerning unfair practice. Holly Cornell of Oregon suggested the use of CEC advertisements in engineering publications explaining the advantages of using consulting engineer services. It also was suggested by Spiller that CEC might cooperate with the Producers' Council on the problem of free engineering.

Registration

George Poulsen of Utah reported on engineering registration committee activities. He told about the

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By threading lead wires under the opposite stay wires and bending ends up and over into the felted blanket, each 2 ft. section of B-H No. 101 Pipe Insulation is secured around the pipe or pipes in a matter of minutes. This pays off in saving time and money, particularly on long runs of large diameters up to 30". No costly or time-wasting banding is necessary. Outside finishes of metal sheet or roofing felt are applied directly over the insulation.

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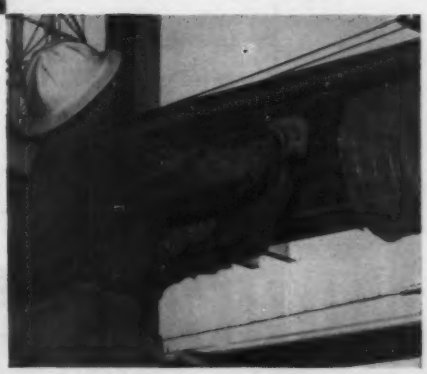
Write for new brochure on B-H No. 101 Pipe Insulation or refer to Baldwin-Hill catalog in Sweet's Plant Engineering File.



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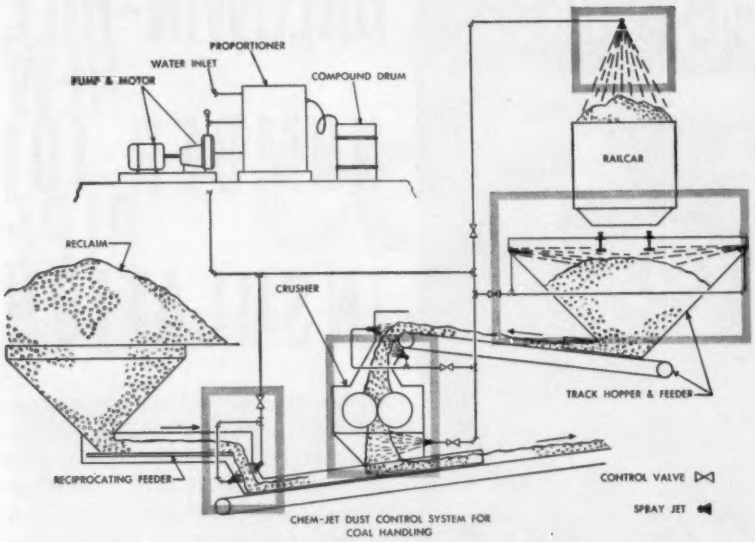

COAL DUST IS CONTROLLED at strategic points by Chem-jet system engineered for efficient, low-cost operation. Schematic diagram of Chem-jet system at large southern power company.

COAL HANDLING DUST STOPPED AT ITS SOURCE BY CHEM-JET

THE ONLY SYSTEM OF ITS KIND, Johnson-March Chem-jet is the low-cost dust control system that attacks a dust problem at its source . . . Chem-jet stops dust *before* it becomes airborne.

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  Chem-jet means low first cost, low operating cost, minimum maintenance.
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  Maximum effectiveness in dust control is assured because each system is designed to solve specific problems.
- Coal Treated With Compound M-R—
  Ends dust problem and eliminates the hazard of fire and dust explosion.

Engineering analysis of your dust problem will be made in your plant at no obligation.

JOHNSON MARCH
DUST CONTROL ENGINEERS
1724 Chestnut Street, Philadelphia 3, Pa.

forthcoming Milwaukee meeting in August which will study a model law. He suggested that the National Bureau of Engineering Registration could solve some of the reciprocity problems as it is a fact-finding body. No action was taken on the corporate practice committee report presented by John Pryke. It was accepted as a progress report.

Fees and Contracts

Secretary Crawford presented the report of the fees and contracts committee for George Heft, chairman. Studies have been made of fee schedules of other organizations, and a further study has been made of a manual of practice. Little progress was reported, however. Results of a questionnaire on fees and contracts practices of the Department of Defense were distributed to members.

Government Planning Procedures

Mr. Pryke reported on conferences with government officials (see "East Coast Report," CONSULTING ENGINEER, January and May 1958) and urged the adoption of the advanced planning procedure of the Navy by the other services. This procedure involves the preparation of a detailed advanced planning report by an engineer or architect-engineer before a construction project is undertaken for a separate lump sum. The detailed report must contain a complete budget cost estimate. When authorization is obtained to proceed with the design, it is Navy practice to negotiate with the architect-engineer who did the advanced planning. Directives from the Department of Defense prohibit competitive negotiation procedures by local contracting offices but these directives have been ignored in certain instances. It was agreed that the amount of supervision by architect-engineers should be stepped up.

Thomas Miles reported on activities of the competitive bidding committee. He urged CEC mem-

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"Sandwich Insulation"—a resilient silicone insulation disc which floats between two rigid discs absorbs shock and vibration and permits the contacts to align themselves. The silicone, under pressure, reacts like a fluid. It flows into all crevices about the contact pins and sockets—positively prevents moisture or dust from passing through the insulation or accumulating to cause failures from short circuits or grounds.

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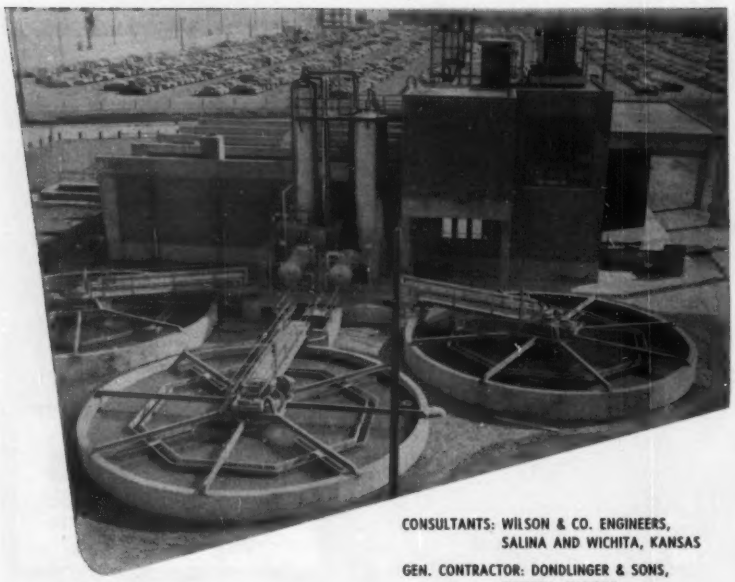

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For a pace setting industry like BOEING AIRPLANE CO., Wichita, large volumes of plating wastes could cause severe stream pollution.

Cooperating with the health authorities' stream cleaning program, Boeing has completed its $1,200,000 waste treatment plant, certainly the mark of a good neighbor in any modern community.

For separation of solids and for clarification of the waste liquids, three CONTRAFLO thickeners were furnished by GFC. All equipment in contact with low pH liquid is rubber lined. The units are equipped with rotary sludge scrapers and automatic sludge removal.

GFC offers a wide variety of equipment for treating process water and wastes. Why not write us today for free bulletins and information.

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bers to report all instances of competitive bidding to the Council. It was suggested that CEC adopt the California Association statement of policy to be pursued by members in handling requests for competitive bids.

Contract Forms

George Poulsen presented the report of the documents committee. General conditions of the contract as prepared by the Intermountain Institute of Consulting Engineers have been studied and action has been withheld until they have had a legal review before copyrighting. The California Engineer-Owner contract form was adopted for use by CEC. Engineer-Architect forms of the New York Association have been reviewed, but it was felt action toward adoption of a standard should be deferred until ASCE, NSPE, and AIA standard forms now being developed become generally available.

Federal-Aid Highways

L. K. Crawford presented the Federal-Aid highway committee report. A meeting with F. C. Turner, Bureau of Public Roads, indicated that with a stepped-up highway program more work would have to be done by consultants. The present highway act discourages the use of consultants, and the 1916 act has been interpreted to exclude consulting engineers from any supervisory activity. Contacts with Senate and House committees on the 1958 Federal-Aid bill were too late to be effective, pointing to the need for Washington representation in the future.

It was reported that Mr. Turner promised to take up with AASHO the concern of CEC with fee schedules. The committee also urged the Council to prepare a suitable brochure to answer the U. S. Chamber of Commerce brochure "Businessman's Guide to the Road Program" which stated that public interest would best be served by building up public engineering organiza-

5 STEPS

in making an almost indestructible turbine

The rotor of a Terry solid-wheel turbine is a single forging of special composition steel. It is first rough turned in two operations, as shown, and then two cuts are taken to mill the semi-circular buckets from the solid metal. The wheel at the top has been finished, ready for mounting on the shaft. *The result is a single-piece wheel with no parts to loosen or wear out.*

Blade wear, which might occur after many years of usage, is not important, because the power-producing action of the steam takes place on the curved surfaces at the backs of the buckets. Thus wear does not materially affect horsepower or efficiency.

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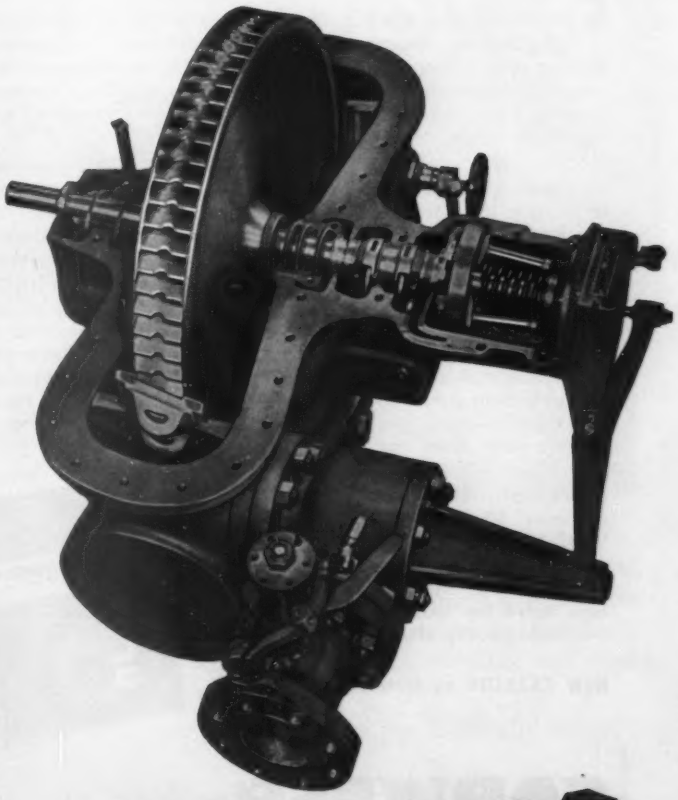

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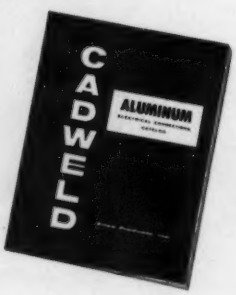
TT-1204

LATEST NEWS in the electrical industry is ERICO PRODUCTS, INC.'s new thermit type welded aluminum connection. Similar to their copper CADWELD PROCESS, NEW connections can be made on aluminum cable to: cable, lug, bus, surface or tube; bus to bus and bus to lug or tube. Also available are transition joints of aluminum to copper.

The new CADWELD Aluminum Process is a controlled exothermic reaction — a reduction of tin oxide by aluminum forming a tin-aluminum alloy. The reaction takes place in a machined graphite block, housing the aluminum conductors to be welded. The reaction produces molten metal which flows over the aluminum (or aluminum to copper) conductors fusing them into a solid homogeneous mass.

Outside laboratory tests have proved the connections to be excellent electrically and good physically. Tensile strength is equal to that of the annealed conductor. Extreme portability of equipment (requiring no outside source of power or heat) gives the customer the Number One aluminum electrical connection that does not loosen or corrode.

New catalog gives technical, instructional and ordering information on over 30 basic type connections. With the growing acceptance of aluminum as an electrical conductor, CADWELD ALUMINUM CONNECTIONS now solve the most difficult problem —a high quality electrical connection.



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tions, rather than utilizing the existing consulting engineer staffs.

Other Reports

George Toman of North Dakota reported on activities of the shortage of engineers committee. It was suggested that more emphasis be placed on professionalism in the curricula of engineering schools. Another factor involved the make-up of state registration boards which are comprised of "socialized" and "captive" engineers, representing colleges and industry engineers. Lack of reciprocity in licensing of engineers in some states also has helped to create shortages in certain areas.

John Pryke, in presenting the report of CEC-Producers' Council joint committee for LeRoy Nettnin, chairman, urged that a permanent liaison committee be set up with the Producers' Council. Pryke also presented the report on membership in the Engineers Joint Council. It is planned to have CEC affiliate with EJC.

B. M. Dornblatt reported for the dues formula committee. It was voted to base the dues on a per capita assessment of the total number of principals in each CEC Member association.

L. K. Crawford reported on the health and accident insurance committee activities. North American Accident and Insurance Co. has submitted a group insurance plan. States where plans are now in effect would be excluded temporarily from the CEC plan. Initially, the plan would only include principals of engineering firms, and then later employees and their families. The plan was referred to a special committee for action. Westcott told about California's experience in working through an independent insurance counselor rather than a broker. Minnesota's experience covering 3000 engineers and their families also was outlined.

The 1958-1959 budget was presented, totaling $39,335. It was voted that this basic budget be in-

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There's smooth going through lines of NAYLOR Spiralweld pipe.

One of the advantages of NAYLOR's exclusive spiral-lockseam structure is its factor of "give" which assures closer conformity to topographical conditions without any sacrifice of strength. This enables you to make up your lines quickly, regardless of terrain or man-made obstructions.

Along with the extra strength and safety built into this pipe is its light weight which simplifies handling and speeds installation. You save even more time and work when you use the one-piece NAYLOR Wedgelock coupling for connections.

For savings in time, work and money—it will pay you to specify NAYLOR pipe for dependable transportation of water and air, and for dredging, materials handling, ventilating and other services.

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MISCELLANEOUS
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. . . that is the combined total hourly capacity of more than 75 International-LaMont Forced Recirculation Generators throughout the country—and the total is rapidly increasing as new units are placed into operation.

The economies of an HTW system (350°F. to 430°F.) over high pressure steam are significant . . . with International-LaMont Generators the savings are dramatic: 15-18% in installation . . . 15-20% in operation . . . 50-60% in maintenance.

Only International-LaMont Generators feature a built-in counterflow economizer which preheats return water and permits use of cost-cutting temperature differentials of up to 200°F.

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Steel Firebox Heating & Power Boilers
Low & High Pressure Water Tube Package Boilers • International-LaMont Forced Recirculation Generators • ASME Code Pressure Vessels & Welded Products.

creased by 10 percent to allow for contingencies and permit additional funds for membership activities and Washington liaison.

Legislation

Ed Wolff discussed Federal bill HR 7168 which was introduced to correct the bid peddling problem. The bill was written to prevent architects as prime contractors from bid peddling on Federal work, after the contract has been signed, with other engineers than those from whom the architect had obtained preliminary estimates. The bill now is being opposed by several building trades contractor associations as it is claimed that it has been rewritten to encourage bid peddling. No CEC support for or against the bill will be given until all building trades contractor associations are in favor of the bill.

A resolution was voted on the contractual responsibility of the Public Housing Authority, limiting responsibility and liability unless architectural supervision of construction is included in the contract or agreement. This action was taken because the terms of the architectural contracts are binding on the consulting engineer.

It was voted to hold the Fall CEC meeting in November in Texas. ▲▲

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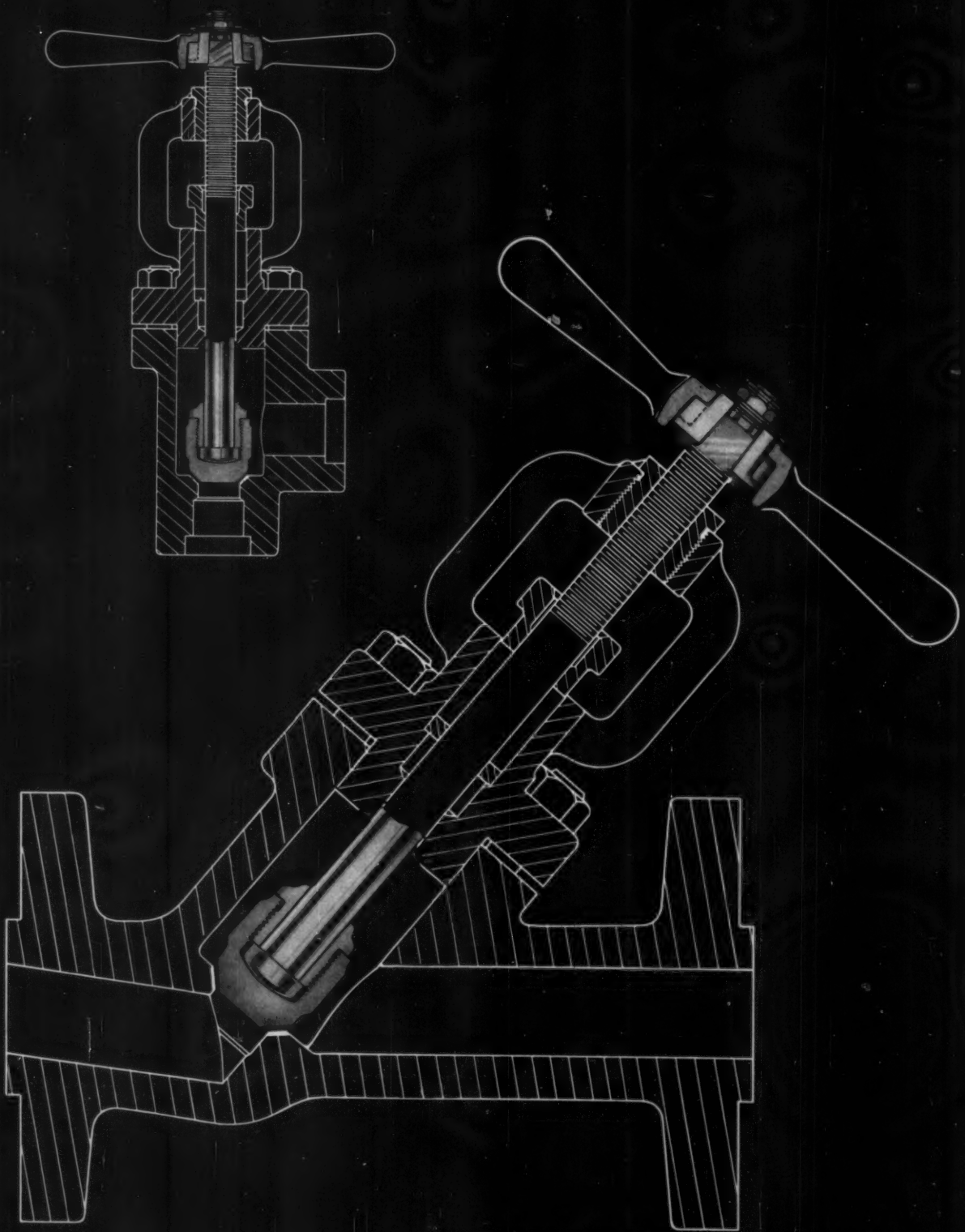

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What's New from Edward Valves

New Products . . . Problems and Solutions. . . Information on Steel Valves from Edward, Long-Time Leader in the Field!

Edward Drop Forged Blow-off Valves

. . . the first—and still the newest!

Fifty years ago, when boilers operated at 250 lb sp the first really efficient means of blowing-down was with "new" Edward blow-off valves. Today, with pressure in the 1800-2600 lb range and with water temperatures sometimes exceeding 600 F, corresponding improvements in Edward blow-off valves have been effected. For example, today all Edward blow-off valves have integral Stellite seats and Impactor* easy closing handles.

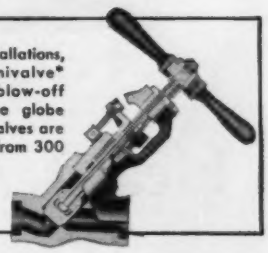
All over the world, high temperature-pressure steam power stations rely on these Rockwell-built Edward blow-off valves. The reasons are basic. Edward valves are simple and rugged in design, with no "trick construction." They operate easily, stay tight, need very little maintenance. If parts replacement is ever necessary, repairs are easier and less expensive than with any comparable valve.

The ASME Power Boiler Code requires steel valves wherever boiler drum pressure is above 200 psi . . . but, because blow-off service is severe at any pressure, operators of lower-pressure plants also have found it most economical to standardize on Edward valves.

Catalog 12-D2 tells the full story.

Recommended practice: Open valve *nearer* boiler first. Then slowly open other valve. After blow-off, close second valve first; then valve nearer boiler. This places greatest wear on blowing valve, assures a tight valve next to boiler, facilitates repair without a boiler shut-down.

Popular for high pressure installations, the Edward welded-bonnet Univalve* meets Code requirements for blow-off service and is ideal all-purpose globe valve as well. Edward blow-off valves are available in all pressure classes from 300 lb to 2500 lb in angle or straight-way styles, with flanged or welding ends.



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*T. M. Reg. U. S. Pat Off.

Heard Around Headquarters

STAFF

THE AMERICAN SOCIETY of Civil Engineers is distributing plaques at the sites of the seven modern wonders of civil engineering in the U.S. selected by the ASCE in 1955.

Plaques have been placed at the Chicago Sewage Disposal Plant, the Colorado River Aqueduct, Grand Coulee Dam, Hoover Dam, and the San Francisco-Oakland Bay Bridge.

In October, a plaque will be placed in the lobby of the Empire State Building in conjunction with the ASCE annual convention. The final plaque will be placed at the Panama Canal in November or December. The Canal Zone governor and ASCE officials expect to take part in the ceremony.

The Hooven Report

Morris H. Hooven, ECPD president, told the Engineers Joint Council-Western Society of Engineers joint meeting recently that the engineering profession desperately needs strong introspection and some idea where it is headed.

"The ancients, making an effort to peer into the future, had a custom of examining the entrails of sacrificial birds. We moderns do it much better by publicly dissecting the minds of platform-inhabiting mammals called a discussion panel. The results are comparable – in either case the correctness of the forecast cannot be determined until after 10 years."

One of the situations Hooven thinks should be analyzed is the professional effect of having only 4 percent of U.S. engineers self-employed, while 88 percent of the dentists, 65 percent of the physicians, 60 percent of the lawyers, and 41 percent of the architects are their own masters.

And why should the future emphasis be put on more courses in the humanities for engineers? Why not, instead, insist on more engineering courses for students outside the engineering schools? "Did not our progenitors in the intellectual world regard the science and engineering of their day as being just as essential to the development of a well-rounded man as the study of the classics?"

Hooven said the proposed survey of the profession, to be sponsored jointly by ECPD and EJC, could answer these questions and many more. "The subject of the survey would affect the community at large far more than it would the profession itself," he added. But Hooven warned that the survey – the most comprehensive ever proposed for any profession – will take more time and money than originally planned. "The future progress of our civilization requires it," he concluded.

EUSEC Conference Report

The sixth EUSEC conference (representing engineering societies of Western Europe and the U.S.) agreed to discuss professional practice by consulting engineers at the next EUSEC conference. Participating societies are encouraged to exchange publications and information about engineers in private practice.

The New York City meeting also passed a resolution asking that participating societies "guide

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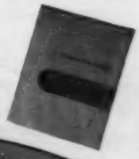

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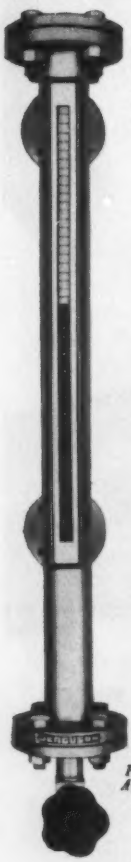

An important advancement in liquid level observation for plants with dangerous explosive or inflammable conditions.

Safety design seals against escaping gases.

Measuring mechanism in stainless steel chamber.

Scale mounted outside chamber; magnetically actuated through chamber wall.

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and, where necessary, control" well-meaning activities of new "so-called international groups without any apparent support from established societies within the same general field.

"This leads to one or more undesirable results such as overlapping, duplication of effort, and a tendency towards a division of loyalty which is not in the best interest of the free interchange of information on engineering progress," the resolution concluded. The problem will receive continued attention, and the Union of International Technical Organizations will be informed of EUSEC's feelings on the matter.

Because of the many important papers and articles published on engineering subjects, "particularly in the newer applications of engineering technology such as nuclear energy, computation, and automatic control," a working party will consider steps to avoid duplication and overlapping among abstracting services. At the same time, the working party will look into the possibilities of making additional abstracts available.

Two new members – Ordem dos Engenheiros de Portugal and Instituto de Ingenieros Civiles de Espana – were admitted to EUSEC. W. H. Wisely, of ASCE, was named secretary to succeed Ove Guldberg of Denmark.

Two working committees were assigned to the topic of education. It was agreed that further study was needed on the "equivalency" of degrees granted in different countries. "If the levels of education are not the same, how can they be evaluated?" it was pointed out. It was suggested that services of professional experts are needed, and a report from a European committee would be advisable before any final action is taken.

IACE Elects Officers

The Illinois Association of Consulting Engineers, at their third annual meeting, in Chicago, discussed problems facing the profession – such as fees and ethics – and elected new officers.

The group was addressed by Charles S. Monnier, Division Engineer, U.S. Bureau of Public Roads, who detailed the new Federal highway program in Illinois, and the role of the consulting engineer.

Committee reports were presented outlining proposed changes in fee schedules, a firmer stand on the subject of ethics, and affiliation with other engineering groups.

Officers elected for 1958-59 were Charles N. Debes, Charles N. Debes Associates, Rockford, president; Junius R. Gardner, Warren & Van Praag, Inc., Decatur, vice president; George D. DeJong, DeJong, Middaugh & Associates, Rockford, secretary; and Robert L. Farmer, Missman, Stanley, Farmer & Associates, Rock Island, treasurer.

Better ASME Journals

ASME soon will offer a better classified version of its *Transactions*. At present the *Transactions* are published chronologically eight times a year. This mixed bundle of technical data is available (along with the *Journal of Applied Mechanics*) for $12. A nonmember can get the *Transactions* and the *Journal* for $13.50.

In the future, the *Transactions* will be divided into three journals, each published quarterly. The sections will be the *Journal of Basic Engineering*, the *Journal of Power Engineering*, and the *Journal of Industrial Engineering*. Any one of these can be purchased for $5 (members) or $10 (nonmembers). All three, plus the *Journal of Applied Mechanics*, can be purchased for $15 (members) or $30 (nonmembers).

Study U.S.-Canada Council

At the annual meeting (Milwaukee, August 21-23) the National Council of State Boards of Engineering Examiners will consider establishing a joint council with the Canadian Council of Professional En-

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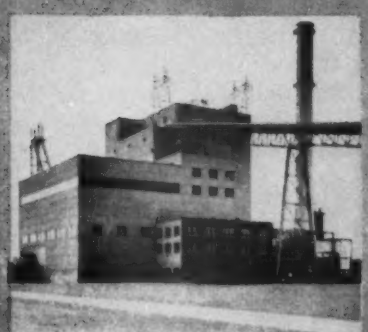

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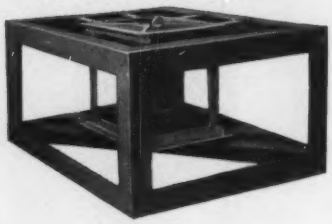

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The Uni-Force Platform Scale is manufactured in a wide selection of standard capacities. It is supplied as a complete, packaged unit which includes either electrical or pneumatic transmission. Because the transmitted signal can be used to actuate a number of devices, the Uni-Force Scale is readily adaptable to such automatic functions as remote indicating, recording, batching, proportioning . . . just about any weight-controlled operation.

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gineers. The Northeast NCSBEE Zone recently recommended a permanent joint organization be formed to exchange information, study mutual problems, and improve cooperation between the registration bodies of the two.

Engineer Unions

A recent Consulting Engineers Council Newsletter referred to the "increasing efforts by the American Federation of Technical Engineers to organize engineering employees of state highway departments."

However, Charles Hall, president of the rival Engineers and Scientists Guild, does not think there is too much to worry about. The AFTE is the AFL-CIO group chartered to represent engineers. Of the Federation's 50,000 members, Hall estimated that "a very small percentage – not over 10 percent – are professional engineers."

"We feel that the American Federation of Technical Engineers is no real threat for representation of the professional engineer," Hall confidentially claims.

Hall said his ESG (which includes both engineers and technicians) currently represents groups with total membership of 22,000. Hall thinks the Engineers and Scientists of America (which advocates separate unions for professional engineers) has a somewhat lower membership.

ASTE Names New Officers

The board of directors of the American Society of Tool Engineers has announced the election of new officers for 1958-59. Their election was held during the society's 26th Annual Meeting and Tool Show in May.

The new president and chairman of its board of directors is George A. Goodwin of the Master Electric Company, Dayton, Ohio (a division of Reliance Electric and Engineering Co.). A registered professional engineer, Goodwin has held various engineering positions since 1910, and is a member of the Advisory Committee on Tool Engineering at Sinclair College.

Other officers elected were: vice president, Wayne Ewing of Arrowsmith Tool & Die Co., Los Angeles; vice president, H. Dale Long of Scully-Jones & Co., Chicago; vice president, William Moreland of F. E. Myers & Bros. Co., Ashland, Ohio; vice president, David A. Schrom of York Division, Borg-Warner Corp., York, Pa.; treasurer, Philip R. Marsilius of Producto Machine Co., Bridgeport, Conn.; secretary, Charles M. Smillie of C. M. Smillie Co., Ferndale, Mich.; executive secretary, Harry E. Conrad of ASTE Headquarters, Detroit; and assistant executive secretary, Allan Ray Putnam of ASTE Headquarters, Detroit.

Twentieth Birthday

The clearing house for consultants, operated by the Association of Consulting Chemists and Chemical Engineers Inc., is 20 years old. ACC&CE headquarters reports that the clearing house receives up to 300 requests annually for services of consulting engineers.

Progress in N. J.

The New Jersey Association of Consulting Engineers, which held its second meeting last month, is arranging a meeting with Governor Robert Meyner to discuss the role of the consulting engineer in the state highway program. Harry Terry, president, said the executive committee will attend the meeting with the governor.

The first draft of the constitution and bylaws was presented to the membership at the recent meeting. Newly formed committees also gave their first reports.

Continuing Effort

EJC has resubmitted its "principles of a sound national water policy" to Washington officials. While not backing any specific legislation on water policies, EJC does advocate a long-range plan of conservation instead of "piece-meal

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For moderate pressure leaks, use Sika No. 4A. This mortar will set within 45 to 60 seconds and plugs will bond to wet leaking masonry and seal seepage quickly and firmly. For complete information on Sika quicksets, write for Bulletin QS-55.

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legislation." The report was resubmitted after President Eisenhower vetoed the rivers and harbors bill.

Originally published in 1951, the EJC water policy was modified and reprinted as a "restatement" in 1957, and then submitted to Congress. The policy has the endorsement of ASCE and AWWA officials as individuals.

Liberally sprinkled with footnotes indicating that the statements do not have unanimous approval of the EJC project committee, the report said that "consideration and control of the waters of the United States are in the national interest, but not necessarily a function of the Federal government."

In regard to public versus private power, the report said, "Production of power for domestic and industrial use is the responsibility of local interests. The Federal government should not undertake any water resource projects exclusively for power development except as required to serve Federal installations."

Long Island Engineers Meet

The Long Island Chapter of the New York State Association of Consulting Engineers Inc. has gone into action with the same speed it was organized.

At the Chapter's first meeting since its acceptance into the State organization officers were elected, a constitution and bylaws committee appointed, dues set, and the group welcomed into the fold by representatives of the State and New York City associations.

Howard Eckerlin, president of the State association, presented the chapter with its charter – the first issued by the State association since it was formed by the Rochester, Syracuse, and Buffalo Chapters.

Robert Holzmacher, vice president, was named to represent the Long Island Chapter on the state nominating committee. Other officers, elected unanimously, are Julius Schubert, president; Darrell A. Weaver, secretary; Edwin Metcalf, treasurer; Horace McAllister and John Stahlberg, directors. They will serve until new officers are nominated in November, elected in December, installed in January.

Dues and initiation fees for the Long Island Chapter are set at $100 a member, with a committee named to see what arrangements should be made for firms with more than one chapter member. Of the $100, $25 will be state dues and $30 will be national dues.

The Long Island group has made plans to contact all county officials in Nassau and Suffolk counties to tell them what the chapter is and does. In an effort to increase the use of Long Island consultants on local projects, county officials will be given directories listing chapter members and their specialties.

Letters are being sent to the building departments in Nassau and Suffolk counties complaining about indiscriminate use of professional engineers' seals on drawings. Schubert said that in some cases the seal of an engineer is placed on drawings of a project which the engineer did not design.

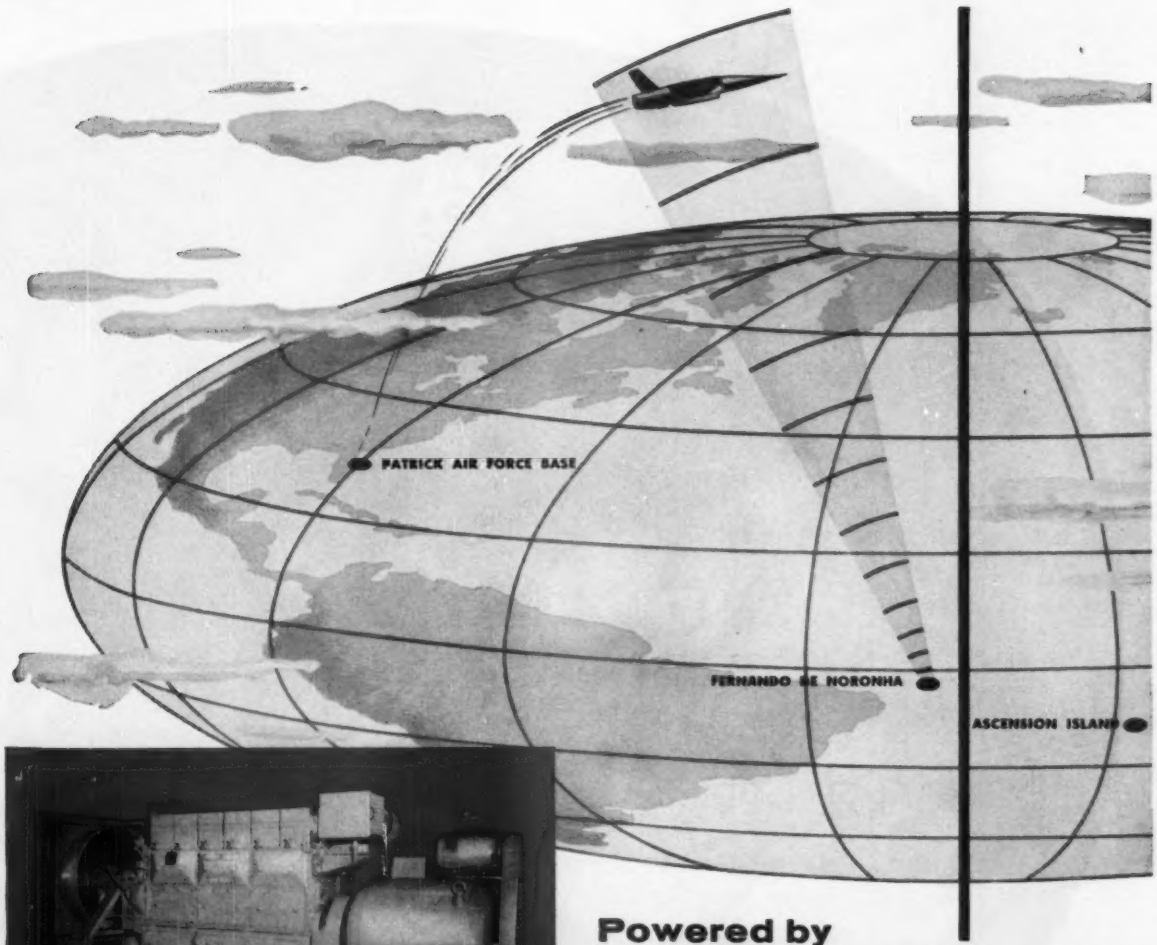
Air Pollution Conference

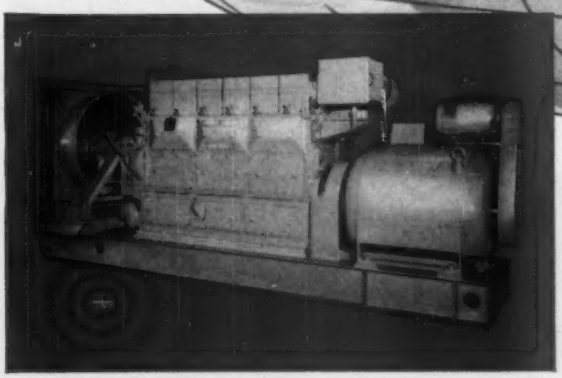
The Surgeon-General of the U.S. Public Health Service has invited EJC to represent the engineering profession at a national conference on air pollution, to be held in Washington, D.C. in November.

Representing EJC on the 16-man steering committee will be Seth G. Hess, director and chief engineer for the New York-New Jersey Interstate Sanitary Commission.

Action Pending

CEC cannot expect an answer to its request for Engineers Joint Council affiliate membership until September. EJC has requested a copy of the CEC articles of incorporation and bylaws. These will be studied by the EJC membership committee, which will present its recommendation at the next board meeting in September. ▲▲





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Down-Range Stations will Track U.S. Guided Missiles

Along a 4,400 mile testing corridor sweeping from Florida southeastward to Britain's Ascension Island, U.S. guided missiles burn their way through tropical Atlantic skies. Soon new radar eyes will be following their flight from atop tiny rocky islands located hundreds of miles from any power station. The U.S.-built tracking and control stations will fill gaps along the missile path . . . will be watching, recording, and ready to explode the missile in air should its behavior become erratic!

Because the guided missile program is vital to U.S. defenses—yet must be conducted with full protection to lives and property—dependability of every piece of tracking equipment is doubly essential. Dependable White's Superior Diesel engines meet the U.S. Air Force requirements for supplying power on this down-range project. These high-quality, heavy-duty engines are world renowned for their continuous, dependable operation and easy starting. Superior's precision construction provides long, trouble-free performance with low maintenance and utmost fuel economy.

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Fusetron dual-element fuses protected 150 motors against burnout when a hurricane single phased our primary line

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CHIEF ELECTRICIAN-THE MANHATTAN SHIRT CO.
PATERSON, NEW JERSEY

Mr. Ackerman continues . . .

"One afternoon a hurricane struck and single phased the line feeding our plant.

"At the time, all 150 of our sewing machines were in operation. No one suspected the motors were running single phase. Our first warning came when the machines started shutting down through the plant as Fusetron fuses began blowing to protect the motors.

"I had no idea in what condition we would find the motors. It was certainly a relief when we checked and did not find one damaged sewing machine motor. Around 300 Fusetron fuses had blown to protect them.

"You can imagine how costly it would have been to repair or replace these ½ hp., 3 phase, 220 volt motors — and our plant would have been out of business while this work was being done. So we think we paid a very small price when our only expense was replacing the 3-2/10 ampere Fusetron fuses.

"Since this experience, our seven other plants have been informed of the above incident, and it has been suggested to them, that they protect all sewing machine motors with Fusetron dual-element fuses."

Why Fusetron fuses provide safest, simplest way to prevent damage from single phasing.

When single phasing occurs, the current in the remaining phase increases about 100%. (Theoretically 73% but change in efficiency and power factor makes it about 100%.

This 100% overload on Fusetron fuses of motor-running protection size opens them and shuts down the motor.

Such dependable protection against motor burnouts from single phasing has never before been available.

You too, can get maximum electrical protection and save money by installing Fusetron dual-element fuses throughout the plant

With rare exceptions on commercial and industrial installations — ordinary fuses and circuit breakers protect only against short-circuits — but Fusetron dual-element fuses provide 10 point protection.

FOR LOADS ABOVE 600 AMPS. — USE BUSS HI-CAP FUSES TO COORDINATE YOUR ELECTRICAL CIRCUITS.

On 600 volts or less, BUSS Hi-Cap fuses have interrupting capacity sufficient to handle any fault current regardless of system growth.

They can be coordinated with Fusetron fuses on feeder and branch circuits to limit fault outages to circuits of origin.

FOR MORE INFORMATION ASK FOR BULLETIN FIS ON FUSETRON DUAL-ELEMENT FUSES — BULLETIN HCS ON BUSS HI-CAP FUSES.

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Atoms in Action

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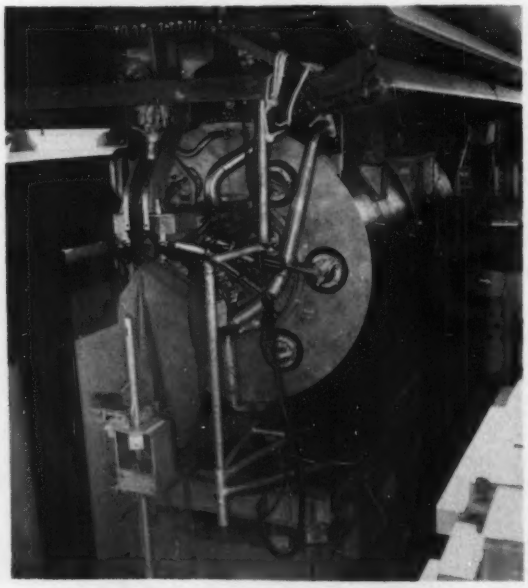
The Nuclear Powered Airplane

CONVENTIONAL propulsion systems for various types of transport are much more costly in terms of capital investment and fuel charges than conventional stationary power plants – when comparison is made on the basis of cost per unit of power produced.



Convair's shield test reactor, shown on lift platform in underground pit, ready for loading into an airplane. This reactor has been undergoing extensive flight tests in a modified B-36 since 1955.

Furthermore, the costs of fuel handling and fueling stations for long-range intercontinental sea or air transport are substantial factors in the total cost of propulsion power. A nuclear powered airplane could drastically reduce the high costs of intercontinental air transport.

The fact that nuclear power plants have been employed first as stationary power generating plants is a concession to their cost – and to their inherent bulk and weight. As reactor technology has been refined, spurred by obvious military applications for small, lightweight reactors for propulsion systems, it is now possible to re-evaluate the role of the nuclear power plant.

Military Has First Priority

The military importance of very long-range aircraft independent of fuel tanker aircraft has obvious priority over any possible commercial applications, so much of the engineering development of nuclear powered aircraft is shrouded in secrecy. Little can be said even about the engineering approaches in solving the many problems involved in the design of nuclear aircraft. However, the matter of feasibility apparently is not in question, in view of the huge governmental programs devoted to the development of such an aircraft. (The Russians claim they will have a nuclear powered airplane flying in the near future.)

Nevertheless, certain general features of what might be considered typical nuclear propulsion systems for aircraft can be described. One plausi-

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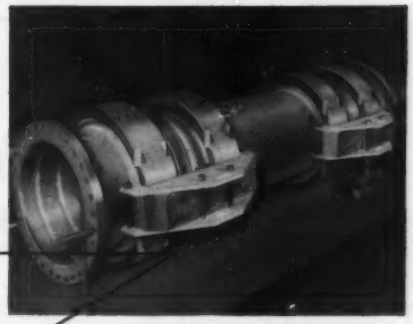

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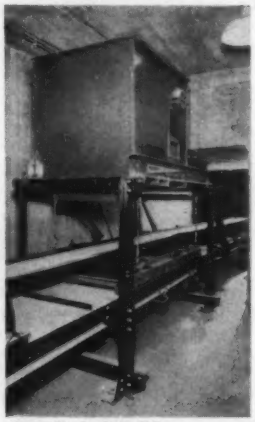

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ble type of power plant for nuclear aircraft is the turbojet engine with the nuclear reactor – or its associated heat exchangers – used as the source of energy replacing the conventional fuel-air combustor. Two general arrangements are possible; one using an air cooled reactor and the other using a liquid cooled reactor with the coolant piped to a heat exchanger in the engine.

The simplest arrangement is shown in Fig. 1, which illustrates a single engine airplane using an air cooled reactor. Air passing through the inlet diffuser undergoes a decrease in velocity from an initial velocity equal to that of the aircraft. As a

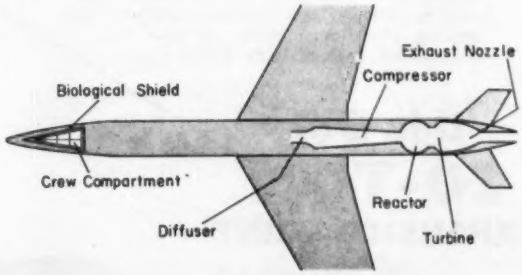

Fig. 1 – Sketch showing air cooled configuration.

result of the velocity decrease, the static pressure increases but not to a point sufficiently high for the operating cycle of the turbojet engine. Consequently, further compression of the air takes place in a turbine-driven compressor. The compressed air then passes through the nuclear reactor where it is heated to a high temperature. The air serves the dual purpose of a reactor coolant and a propulsion fluid. After leaving the reactor the high temperature air expands in a gas turbine. The turbine develops enough power to drive the compressor plus necessary auxiliary devices such as generators and pumps. The remaining expansion occurs in the exhaust nozzle where the air is accelerated to a high velocity. The change of momentum of the air passing through the engine (including diffuser, compressor, reactor, turbine, and exhaust nozzle) results in the thrust which propels the aircraft.

Air Cooled Reactor Inherently Large

There are a number of major difficulties involved in the design of this type of nuclear propulsion system. Because of the low heat capacity of air, the reactor requires extensive heat transfer surface which means a very bulky reactor. The oxidizing power of air is another detriment in a reactor where

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Sketch of the Johnson's Wax administration and research center.

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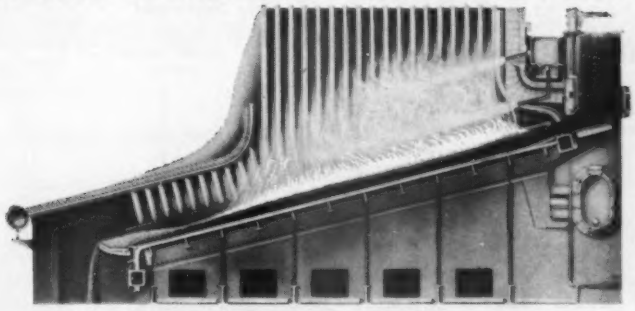

Side elevation of a typical Vibra-Grate Stoker installation

Mr. Adrian R. Wilson, Assistant Power Plant Manager, says this about the AE Vibra-Grate Stoker now in its 4th year of operation at the Racine, Wis., plant of S. C. Johnson & Son, Inc.:

★ Never an unscheduled shutdown during 10 months' continuous operation in each of 3 years.

☆ Cost of repair parts approximately one cent per ton of coal burned . . . total cost slightly less than $200 while burning 20,169 tons.

★ Evaporation rate of 11.3# of steam to 1# of coal . . . 19% improvement over figures before installation of Vibra-Grate.

★ Continuous operation at 150 psi . . . load swings of 15,000 - 20,000# with only 3# to 4# variation in pressure.

☆ Smoke and fly ash eliminated almost entirely, even in load range of 5,000 - 40,000# per hour. No fly ash collector needed. Since our plant is located in a residential area, elimination of these nuisances is extremely important from the public relations standpoint.

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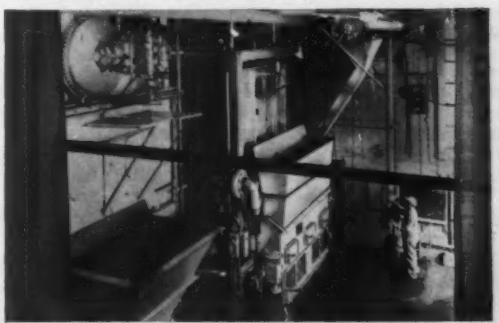

The Vibra-Grate as viewed from Mr. Wilson's office

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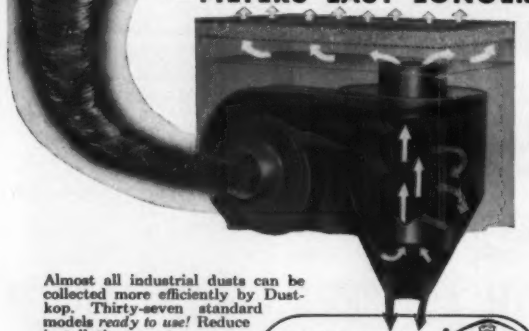

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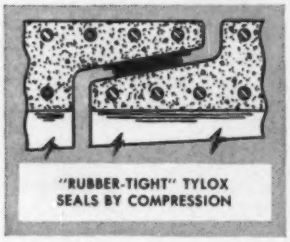

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the corrosion of materials is a serious consideration. Still another disadvantage is that restriction to an air coolant limits the choice of reactor types. Finally, the air and the impurities accompanying air become radioactive during passage through the reactor. Since the air is discharged into the local atmosphere, it constitutes a considerable hazard for personnel in the immediate vicinity.

Advantages of Liquid Cooled Reactor

A second configuration is shown in Fig. 2, which assumes a twin engine aircraft with a central liquid cooled reactor located in the fuselage. The reactor is cooled by a liquid which ideally has high heat

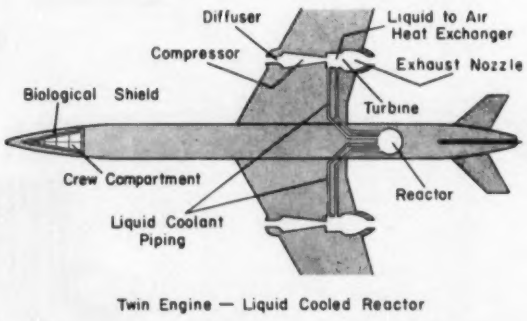

Fig. 2 — Sketch showing liquid cooled configuration.

capacity, good heat transfer characteristics, good flow characteristics, and is noncorrosive and highly resistant to effects of radiation. The cooling liquid is pumped to heat exchangers in the engines, which are placed in the wings.

This arrangement offers several advantages. The choice of reactor types is broadened, the possibility of a more compact reactor exists, and greater freedom with reactor geometry is possible. The coolant acts as a shield between the reactor and the air so that engine discharge is essentially nonradioactive.

Coolant Is Major Problem

The selection of an optimum liquid as coolant is clearly a major consideration and consequently detailed data are not available. Another problem is the fact that the maximum temperature which can be permitted for the coolant leaving the reactor is about 1000 F because of limits imposed by reactor materials. A gas-turbine power plant, particularly a high-performance aircraft type, cannot operate very efficiently when the turbine inlet temperature is below about 1100 F. Either new reactor materials or new types of reactors are needed to solve this problem. One possibility is the liquid-metal-fuel re-

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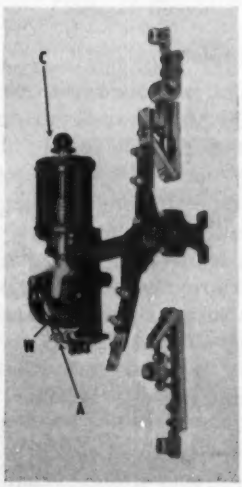
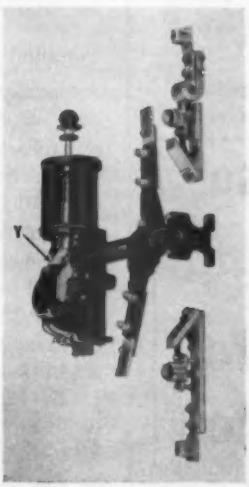


1. ASCO NORMAL POSITION — MECHANICALLY LOCKED. Coil (C) de-energized. Compression spring fully extended. Rotating weight (W) at rest. Angular placement of connecting linkages locks weight and main contacts firmly in position. Movable and stationary circuit control contacts (A) are closed.



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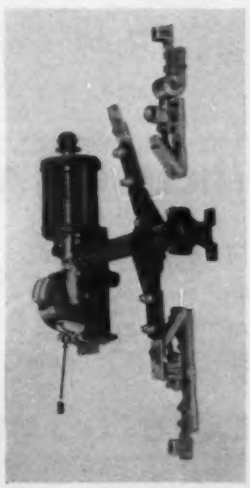

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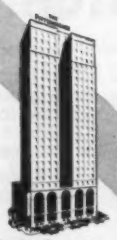

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actor in which the fuel is alloyed with a liquid metal and the molten alloy acts as fuel and coolant circuit. This type of reactor should be capable of higher temperatures. Undoubtedly other possibilities are under study but the information is not available for publication.

Shielding Development

Progress in development of lightweight biological shields to protect the flight crew is another important factor which is not available to the general public. However, a general principle to be followed in reducing the level of radioactivity encountered in the crew compartment is to locate the crew as far as possible from the reactor. This will minimize the amount of shielding required to protect the crew. A physically compact crew compartment also will aid in reducing the weight of biological shielding.

Available information on nuclear powered aircraft can support nothing but the wildest speculation as to its economic prospects for commercial aircraft. It is quite possible, however, that unreleased information or a major breakthrough in technology could clearly establish the commercial importance of nuclear powered aircraft.

Potential of Nuclear Airplane

Some significant advantages are evident. An aircraft could fly around the world several times without refueling. The cost of periodic fueling of the reactor would be small compared with the cost of conventional hydrocarbon fuels. Although the power plant would be very large and heavy, gross airplane weight might be reduced by elimination of the fuel load carried in conventional long-range airplanes. The investment in the power plant would be greater but it is possible that the fuel savings might more than offset the greater capital cost. Costly fuel handling and storage facilities also could be eliminated.

One drawback of nuclear powered aircraft would be the hazard associated with a crash. Here not only the safety of crew and passengers is in question but the safety of those in the crash area. Yet it is entirely possible to design the reactor in such a way that the hazard of a crash could be minimized to a point where it is no worse than that of conventional aircraft accidents. In fact, a nuclear reactor could involve less hazard than the explosion of fuel tanks and the subsequent fire attendant in conventional aircraft.

Certainly, efforts to develop nuclear aircraft are warranted. It is within the realm of possibility that nuclear power will ultimately provide a solution to many of the current long-range air transport problems. ▲▲

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This is the principle on which the Yarway IMPULSE trap design is based—that variations in temperature of water discharging through two orifices in series cause variations in pressure in an intermediate chamber between the orifices, and that these changes in pressure may be utilized to open and close the trap valve.

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There is only one moving part in a Yarway IMPULSE trap—a small, stainless steel valve. The entire valve assembly can be replaced in 5 or 6 minutes. It is the simplest of all steam traps to service.

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Research and development in the Yarway Steam Laboratory, plus intensive field testing, have produced a line of steam traps—*all* of the Yarway IMPULSE type . . . to efficiently meet each of the following classes of trapping service:

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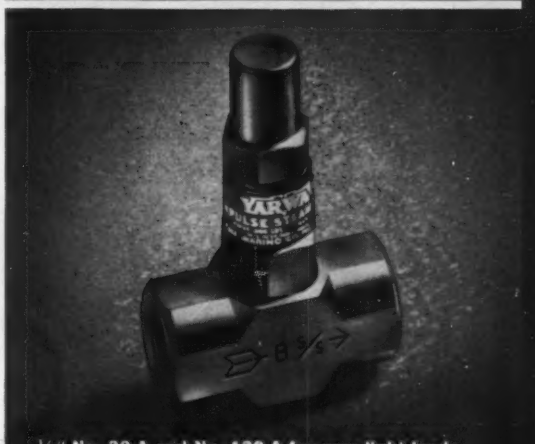

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Teaching Schools About Consultants

HAVE YOU DONE any recruiting lately? How did it go? Probably the response from civil engineering seniors was fairly good. They were familiar with consulting engineering, and the field looked attractive to them. Response from electrical and mechanical engineering seniors was discouragingly feeble. Not many students signed up for interviews, they did not rank very high in their class, and you spent most of your interview period telling them what consulting engineering is all about.

CE exclusive

Why this lack of interest? In today's market for engineers (excluding effects of the current recession), the student has an awesome pair of decisions to make in his senior year. He must decide which 10 of 400 interview opportunities he will accept. Then, if he is a top-notch man, he must decide which of the resulting 10 job offers to take.

He probably makes these decisions in much the same way most of us make purchases; he looks for familiar brand names. Therefore, if our profession and your firm are to get the men we want from colleges, these men must recognize and react favorably to two brand names. The first is "consulting engineer." The second is your firm's name.

Industry Has the Advantage

A student will decide to take an interview with the Colossal Manufacturing Company for many reasons. He may have heard about the company and its fields of activity through its general public relations program, or through its advertising. He may have seen copies of company brochures sent to his college, or he may have heard about the company from fellow students who worked for it in the summer. Perhaps he heard a talk that a company engineer gave at the college. A faculty member may have mentioned the company favorably. The student's parents may have been influenced by their familiarity with the company's products.

Unfortunately, none of these factors are likely to be working in favor of our profession or any par-

JOHN C. HITT
Jackson & Moreland

A graduate electrical engineer from the University of Washington and Massachusetts Institute of Technology, Mr. Hitt has held plant engineering jobs with Baldwin Locomotive Works and Boeing Airplane Co. In his 15 years with Jackson & Moreland he has served as field engineer, electrical engineer, project manager and, at present, head of the Electrical Design Division. In addition, Mr. Hitt is chairman of the Boston Section of AIEE and is outgoing president of Engineering Societies of New England, Inc.

ticular firm of engineers in private practice. Because of this we probably must accept graduates from the middle or lower third of their class.

Does it really matter much whether a consulting engineer hires the top men from the engineering colleges? Each of you will have to judge that for your own firm. I am convinced, though, that consulting engineers have greater need for excellent graduates than almost any other field. We do not sell a physical product that can be advertised and promoted and chrome-plated and styled until its basic merit is hidden. We offer the minds of men. Our services are only as good as these minds.

Telling Our Story

Organizations of consulting engineers, each consulting engineering firm, and you as an engineer, should be making opportunities to tell faculties and students about our profession.

Most professors recognize that it is their responsibility to make their students familiar with the several fields of engineering work. You will find them interested in learning about private practice and your firm. One way to tell them about your profession is to select perhaps 10 key men from your nearby engineering colleges and invite them to your office for a day—just before school starts in the fall is a good time.

Carefully prepare your program but leave the last third of the day for them to educate you. Ask them questions like these: "Is our use of young engineers properly professional? In particular, do you agree with our attitude toward using a graduate engineer at a drafting board? Are our policies for training and promoting men sound? Are our starting pay and our subsequent salary levels reasonable? What do students look for in choosing an employer? How can we best go about getting your superior students? Just what do you think of the consulting engineering profession in general and our firm in particular? What did you learn today that we should particularly try to get across to other faculty members and students?"

You will be surprised at the answers. Do not argue the points. Accept them and learn what you have to contend with. Correct only matters of fact.

Faculty Consultants

A professor who serves your firm as an occasional consultant is a valuable representative for you at his college. He can interest students in consulting engineering and your firm. He will be able to advise you of students you should try to hire. Probably you will not hire a professor with this aspect foremost in your mind, but do not ignore it.

Summer Jobs for Faculty

Employing faculty members for the summer in your office can be an aid to your recruiting efforts at their colleges. However, it has pitfalls. A professor will not boost consulting engineering or your firm if he is dissatisfied with his summer job. The difficulty is obvious. The usual professor is a theoretician; your work is 10 percent theoretical and 90 percent practical. How do you use him effectively?

The best solution is to find theoretical work for him. If this is impossible, explain to him the facts of life in a consulting engineering office and invite him to be practical for the summer. He may surprise you by saying this suits him fine, as a change from nine months in an ivory tower.

Above all, get this carefully figured out before he comes to work in June. Consider the tragic (and true) case of the associate professor who worked last summer for one of the glamor outfits of American industry. The executive who hired him was transferred in May, and his successor never had heard of the professor. They put him on the payroll all right, but they never did figure out what to do with him. He spent the summer in a corner shuffling blueprints. What do you suppose the professor is telling his students this year about that company?

Faculty Contacts

Professors are generally friendly, and they are anxious to know what is going on in your organization. The next time you are near a college, drop in and introduce yourself to the Dean of Engineering or a department head. I predict that you will get a much

more cordial reception than you usually give to a man who drops in to see you. These contacts can be followed up at technical society meetings and committee activities.

Placement Seminars

Some engineering colleges help students make wise job choices by conducting a seminar at which invited guests describe various fields of engineering work. If this is done at your local college, get a consulting engineer on the program. If it is not done, try to sell the idea to the Dean.

If a placement seminar is not available, do not give up hope of talking to student groups. Student branches of AIEE, ASCE, ASME, and the other engineering societies meet regularly and need programs. The student officers usually select the programs, but the approach can be made through their faculty advisers.

Student branches are very wary of programs that have any smell of selling a particular company. They are all too familiar with the talk or film with some innocuous title that comes out as a blatant recruiting promotion piece. To avoid this, offer your talk as one dealing with the consulting engineering profession, not your own firm – then actually make it that way.

Summer Jobs for Students

Summer jobs for students often are a nuisance. You are unlikely to get your money's worth out of a student. He spends 10 weeks adjusting the angle of his drafting board and finally turns out a drawing during the last 10 days. However, if you treat him right, he is an excellent salesman for our profession and your company. He will tell his fellow students about you when he returns to school. Treating him right means giving him reasonably interesting work, choosing his immediate supervisor with some care, giving him an over-all picture of company operations beyond his routine job, and paying a little attention to him as a person.

It is much easier to hire a top-ranking student for the summer between his junior and senior years than it is to sign him up after he graduates. If you hire him for the summer, treat him well, and maintain contact with him when he returns to school, you have a head start toward getting him permanently into consulting engineering and your firm when he graduates.

Other Approaches

One approach to faculty members and students is a brochure describing either the consulting engineering profession or your firm. But it will be competing with a number of other excellent publications. Every engineering student or faculty member has available at his college placement office scores of brochures from industrial organizations. Most of them are skilled products of advertising and public relations men. You will have to do as well or better to attract student and faculty readers. This will be difficult but not impossible.

A number of technical magazines, including those published by the engineering societies, have carried articles describing opportunities for young engineers in particular fields of activity. The articles usually are good. The question is whether they are read by their intended audience. Faculty members probably read these magazines with about the same degree of spasmodic thoroughness as the rest of us. I doubt that a student spends much time on them, even though student membership in a national technical society gives him a subscription to the society's magazine.

The logical places to print these articles are the student magazines. They always are looking for good copy. A series of four to six articles about the opportunities for young engineers in the consulting engineering profession certainly would be accepted by the editors of most student publications. These articles could deal specifically with civil, electrical, and mechanical engineering opportunities; operations of large engineer-constructors, large independent consulting firms, and smaller consulting firms.

Later the articles could be reprinted in an attractive brochure. This would produce a publication of a suitably objective nature. Its distribution, to be effective, would have to be well planned. It could be handed out whenever a consultant talked to a student or faculty group. It could be used not only in engineering colleges but in high schools.

One Program Planned

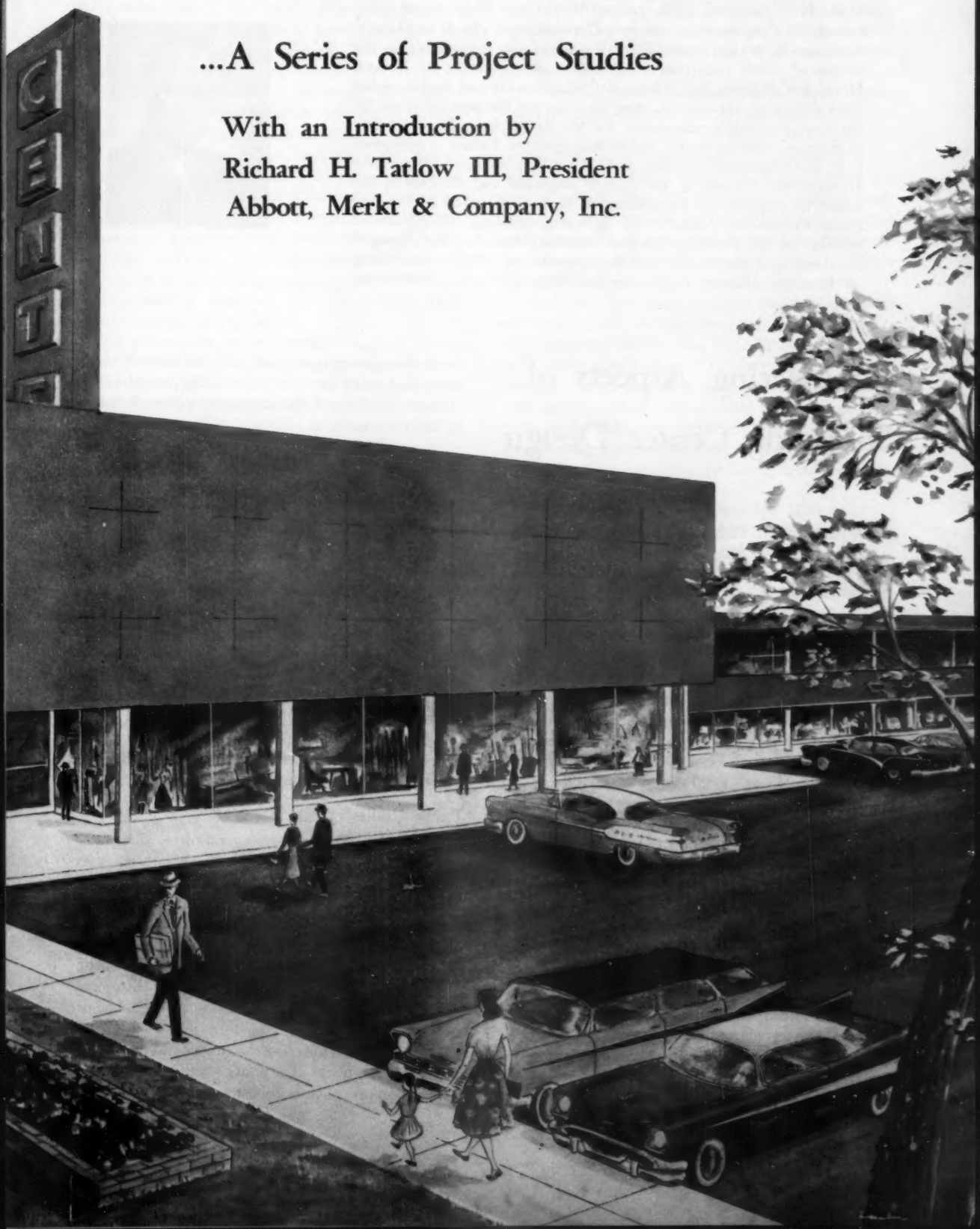
A technical committee of one of the national engineering societies has just this sort of program in the planning stages. They will turn out papers on the opportunities for young engineers in four fields of particular interest to the committee. One of these, fortunately, is consulting engineering. The papers will be presented at a national convention of the society. Then they will be printed in a much more eye-appealing form than the usual technical paper reprint. This brochure will be distributed to the society's student branches. To be effective, this distribution should be tied in with a program or perhaps a forum on the same subject at each student branch.

The more programs of this type we have, the better chance we have of assuring the future success and standing of our profession. Competition for the best college graduate is fierce. We must recognize the problem and do something about it – as a profession, as firms, and as individuals. ▲▲

SHOPPING CENTERS

...A Series of Project Studies

With an Introduction by
Richard H. Tatlow III, President
Abbott, Merkt & Company, Inc.



RICHARD H. TATLOW III, President, Abbott, Merkt & Co., Inc.

Richard H. Tatlow III, who holds two degrees from the University of Colorado, has been designing important structures in all parts of the U. S. for many years. During World War II he was a member of the Construction Advisory Committee of the War Department, served in the General Staff Corps, and was responsible for the design of much industrial construction. As president of Abbott, Merkt & Company, Inc., whose staff of architects and engineers has been designing department store facilities for the past 34 years, he has been personally responsible for the design for a large number of shopping centers, stores, and parking garages. Tatlow, a registered P. E. and Structural Engineer in 17 states, has been president of the Metropolitan Section of ASCE, vice president and director of the American Institute of Consulting Engineers, chairman of the National Engineers Committee of EJC (representing ASCE), and a member of the Building Research Advisory Board of the National Academy of Sciences. He also is a member of ASME, the Society of American Military Engineers, and Army Ordnance Association.

Engineering Aspects of Shopping Center Design

SHOPPING CENTERS – merchandising marvels of the Twentieth Century – are more than 70 percent engineering design. While this type of construction, measured in hundreds of millions of dollars, has been a challenge to engineers for the past decade, the future will demand the best that even the most qualified consulting engineers can offer.

CE exclusive

There are three distinct kinds of shopping centers, and all have similar engineering problems, although design complications increase with size.

¶ Neighborhood Centers: Up to 75,000 square feet of floor space; from 5 to 20 stores; a parking capacity up to 500 cars.

¶ Community Centers: Up to 250,000 square feet of floor space; from 20 to 40 stores; a parking capacity up to 1000 cars.

¶ Regional Centers: Over 250,000 square feet of floor space; more than 40 stores; a parking capacity of more than 1000 cars.

The type of center required generally will be determined by means of a study made by economists and real-estate men who examine population, buying habits, and other influences upon the sales potential of the trade area. Often the engineer participates in assembly and evaluation of these data.

Planning time is not short. One to three years is the rule for this phase of the project. It is not so much the gathering of data and preparation of reports that takes the time as it is the consideration of these results and the activation of the decisions by the owners.

Site Selection

Regardless of the reasons for the selection of a particular site for a particular kind of shopping center, it is the consulting engineer's job to examine intelligently every facet of the proposed site area.

Is the area adequate for the type of center planned? A good check is a comparison of the gross usable area with the probable gross building area. Four times the building area should be the lower limit. A ratio of one to five is better. To this should be added area for expansion. Cost and availability of the land may affect planning, even to the point of dictating multistory parking areas and stores. Land costs of $10,000 per acre are not uncommon. A few centers have been built on land purchased at over $50,000 per acre.

Traffic Studies

Traffic is the next engineering problem. Can automobile movement, in the volume anticipated from all points in the trade area, be handled properly? If the answer is no, the site will have to be abandoned. A shopping center without easy access from all zones of its trade area is a bad business venture; therefore, traffic studies are required early. These reports will predict the flow of customers and, consequently, will influence project layout and key store locations.

The economic study for the proposed center will have fixed the trade area limits – and probably the distribution of potential customers in each zone

of the area. Reports based on this data, plus an analysis of population and road plans, will indicate the distribution of shopping traffic for all roads of the feeder network. Driving time studies will also serve as a check of the results. Few shoppers will drive more than 30 minutes to even the largest regional center, and no more than 7 or 8 minutes to get to neighborhood centers.

Maximum shopping traffic is estimated with the knowledge that peak conditions will occur for major selling seasons, that daily and hourly variations will emphasize the peaks, and that the design should allow for an excessive 25 percent peak at times of heavy congestion. Fortunately, shoppers seem to thrive on a certain amount of congestion. Experience indicates that peak shopping traffic hours are 5:30 P.M., 7:30 P.M., and 9:00 P.M. The movement of cars at these hours is a factor that can be expressed in terms of the net rentable 1000 square feet of building area.

The percentage of total daily shopping traffic hour by hour is shown on the two charts at the bottom of this page, one indicating traffic variation for a store open for business from 9 A.M. until 6 P.M., the other for a store opening at noon and closing at 10 P.M. With data of this type estimates can be made not only of total shopping movement, but of distribution to all highway facilities serving the site from all parts of the trade area.

Coordinating With Governments

Through-traffic data, suitable for the preliminary estimates, undoubtedly will be available from various authorities, but as the studies progress, the engineer may have to make his own supplementary traffic counts and his own forecasts of future through-traffic conditions. Peak periods for the year, month, day, and hour must be determined, and the through-flow added to the shopping traffic to ascertain over-all traffic conditions. Traffic flow in and out of the center, at the estimated peak rates, must not only be carried on entrance and exit and access roads but also on the interior road system, which is so closely allied with the parking areas.

Road, road intersection, and weaving capacities are easily established and can be compared with the estimated total traffic. Bottlenecks are quickly spotted and solutions can be sought. Shoppers must have comfortable driving conditions or they will go elsewhere.

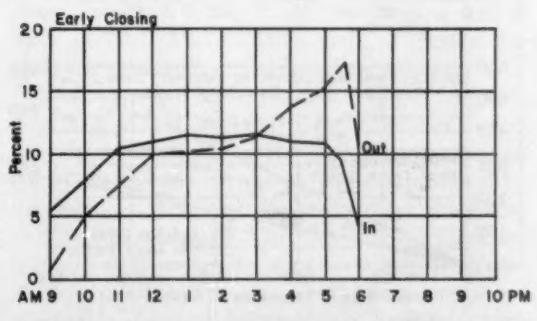
It remains for the engineer to review his complete findings with all local authorities having interest in or jurisdiction over streets and highways. Town, county, and state engineers appreciate being informed early, and, if convinced the project is going to be built, they will cooperate in finding practical solutions for traffic bottlenecks. Political bodies will most certainly be involved, and full agreement, prior to the start of construction, will eliminate many difficulties later.

Truck and bus traffic requires that the engineer work out details with the transportation and trucking companies serving the area. Truck movements have been surveyed in a number of centers and there is a composite chart on page 88 giving design information. Along with making provision for the peak truck traffic, the engineer should see to it that an adequate number of docks or street positions is available. A guide to the number of truck docks to serve average traffic is:

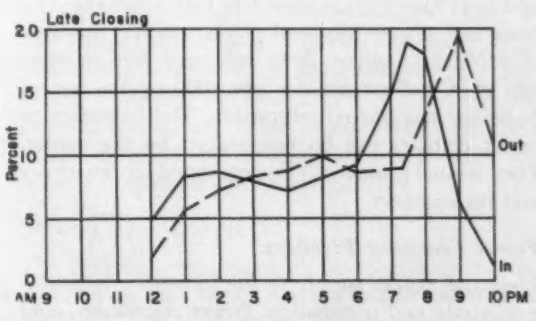
Miscellaneous stores	0.057 per 1000 sq ft
Supermarkets	0.105 per 1000 sq ft
Department stores	0.023 per 1000 sq ft

Utilities for the Shopping Center

Shopping centers need the same utilities as any business district, and the consulting engineer must work closely with all parties concerned so that utilities can be provided at costs that can be justified. In a built-up urban area, the municipality and the utility companies can be counted on to bring — without cost — water, gas, sewers, and electricity to within a few feet of the building line; cities or counties frequently build parking areas nearby, and



Hourly traffic in percent for early closing store.



Late closing store shows this pattern of traffic.

they usually supply and pay for street and parking area lighting, police protection, and rubbish and snow removal. But the shopping center that provides its own parking space has a large land area, and the actual building lines may be a long distance from the property line. Then the utilities and municipal services will be stopped at the edge of the site unless the owner and his engineer are able to negotiate a fairer treatment.

Water – in quantities and at pressures proper for sprinkler or fire protection – is important for some community centers, and for all regional centers. Independent fire lines or loops, duplicating the domestic lines, may be required by insurance companies or local codes, even though these same regulations would accept connections for both domestic and fire lines from one common line in the downtown street. The cost of bringing water to the buildings of a regional center may reach $100,000, and elevated tanks to give pressure and a secondary supply can add substantially to that figure.

Gas Service

In any type of center, the gas companies can be counted upon to furnish and install the supply main to the buildings. They will also provide supply lines and a meter to each tenant if this can be accomplished underground. In large regional centers, with full basements, the gas company will stop its work in a few common meter rooms. From these the owner must pay for the running of lines to each tenant. A materials and installation cost of $25,000 is not unreasonable in large centers.

Storm drainage must be designed to do the job at the lowest cost, so the engineer should take full advantage of all grade conditions to let water run on the surface as far as practical, thus minimizing the required underground installations. The presence of natural water courses or of adequately sized sewers will show up in the site analysis. Any offsite improvements must be settled with local authorities. Storm sewer costs of from 5 to 10 cents per square foot of yard area are normal.

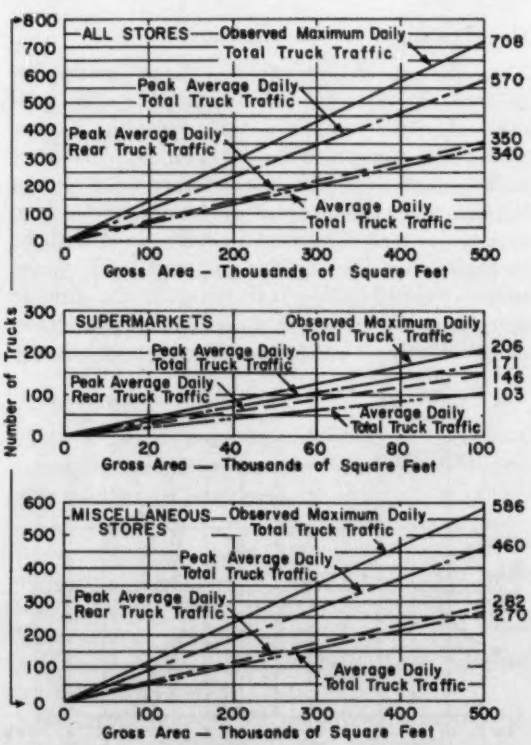
The site may not be supplied with sanitary sewers and laws may require complete yard collection systems and sewage disposal plants, costing upwards of $150,000. Sanitary flows will vary, but an average of 90 gallons per day per 1000 square feet of buildings has proved reasonable. The formation of sewer districts can be encouraged by the center. Then annual rentals can be negotiated by the owner and his engineer.

Power Company Practices

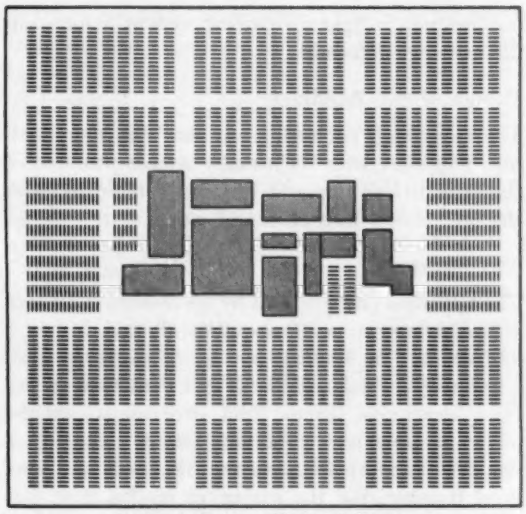
Electrical power supply to the stores needs intelligent study and negotiation. Power companies, controlled by public service commissions, endeavor to be as cooperative as possible, but rules and regulations (which do not treat a center as though it were a downtown commercial area with an approved underground network) require that the owner assume much of the cost. This burden on construction costs may come to 50 cents per square foot.

In general, the power company will build, at its own expense, the overhead pole lines into the property. If the stores can be served directly from these lines, the center will not have to incur much expense. This type of service is the unsightly kind usually found in alleys and is suitable for only strip centers where the approach can be from the rear. In most regional centers, it is not desirable to have pole lines too close to the buildings, so a compromise solution must be negotiated with the power company. Frequently, the power company will share in the cost of underground service to the extent of supplying the cables and transformers. Ducts and transformer vaults are supplied by the center. The cost of feeders from the meter rooms to each tenant also is borne by the center.

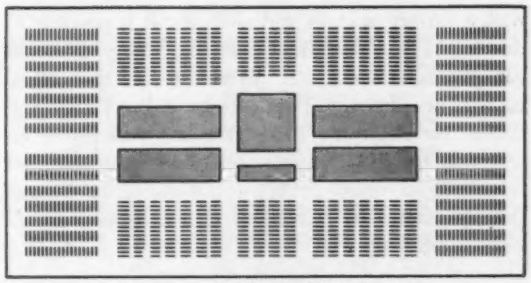
The ideal situation would be one in which the center could purchase the total electrical requirements at high voltage from the local utility and resell, on sub-meters, at low voltage, to each tenant. The income available to the owner might be 20



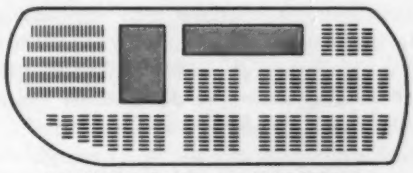
Truck traffic vs. gross area for various store types.



Regional Center — Cluster Scheme



Community Center — Mall Scheme



Neighborhood Center — Strip Scheme

Three general patterns of building arrangement are used in shopping centers. Engineering differs for each.

cents per square foot of buildings. This is prohibited, however, in many states by law or by order of the public service commission.

In any event the consulting engineer should have discussions with the utility company early in the design stage. Together they can determine the best and most economical method of servicing the center, making decisions as to the location of the substation, pole lines, underground lines, all necessary transformers, and auxiliary equipment. The utility company probably will request transformer vaults in several locations, thereby permitting them to keep down the length of feeders to the tenants. They also like to have the tenant meters assembled in one or two locations in each building. Meter rooms should be adjacent to the transformer vaults.

Layout of Buildings

Placement of the buildings on the site will be a team undertaking for the owner, the architect, the economic consultant, and the consulting engineer. Arrangement of the buildings may follow one of three general patterns: strip, mall, or cluster. For each the engineering problems are different.

The layout will affect the costs for grading, utilities, access, and structure — even the mechanical and electrical phases of the buildings themselves.

Parking and car circulation, to be determined by the engineer, can safely be planned for grades up to 6 percent, although 2 percent and 3 percent are better. Buildings can be stepped to help make use of steep sloping sites, and short, steep ramps are acceptable. Successful centers have been built with site elevation differences of 80 to 100 feet.

Two-level layouts are not handled easily, and rental returns to the owner may not be as great as they would be if all stores had been built with only one common mall or sidewalk level. There are exceptions, however, and grading may dictate a search for a two-level plan. If used it is important that traffic feeding in and out of the center, as well as parking and store selling space, be distributed about equally on each level.

Strip centers, with one side on a service alley so that utilities represent little or no direct cost to the owner, have much to commend them in the way of lower over-all costs. They are used for all neighborhood centers and many community centers. The advantage in lower cost will be about $2 to $6 per square foot of store buildings.

Truck tunnels to serve all buildings of the center are extremely desirable if they can be justified, but it probably means an added investment of from 50 cents to $1.00 per square foot. One-way tunnels are the rule, but they usually serve store service areas on both sides, so they require about 30 feet clear width. One-side service will work in 24 feet. Tunnels below open malls must carry a 250-lb live load, plus the weight of any protected waterproof membrane; hence, study should be made of the possibility of running tunnels through the basement space below store buildings.

Parking Area Layout . . .

The parking layout must be developed by the engineer with due regard for traffic flow, as well as for the habits of shoppers. Almost every conceivable parking design has been used somewhere —

with a variety of stalls and modules. It is possible to develop a mathematical formula, using assumed car characteristics, and arrive at the theoretical maximum efficiency. Publications of the Eno Foundation for Highway Traffic Control will prove interesting for the consulting engineer who may not have solved these problems satisfactorily before, but, as usual, the published standards are not always applicable.

. . . For Cars

A decision will have to be made between diagonal and right-angle parking. The personal opinions of the owner may well decide the issue. Either plan will work, and work well, if properly designed. A 90° parking plan with comfortable spacing will handle about 5 percent more cars than a similar layout using diagonal parking. The angle of diagonal parking can be 45° to 60°, or more. All arrangements will work satisfactorily.

Stall widths vary from 7 feet 9 inches to 10 feet, which proves that standards are not firm.

Good parking lot design will use 8 feet 6 inches or 8 feet 9 inches for stall width, and 61 feet or 62 feet, out-to-out bumpers, for two cars and the driveway, in 90° parking. For 60° diagonal parking, a satisfactory module is 54 feet, assuming that there is meshing of the sawtooth edges. All stalls should be marked with double 4-inch lines, 2 feet apart and 18 feet long. These markings help the driver to center the car.

With 90° parking, two-way traffic is normal. With diagonal parking, much two-way movement can be expected. Better control is possible with stall and lane bumpers, but they will add cost, complicate street cleaning, and present an insurance hazard.

Parking for 7 to 10 cars per 1000 square feet of buildings is reasonable. The accepted average of 400 square feet per car includes distribution roads, driveways, and all parking stalls.

. . . For Pedestrians

The distance that shoppers are willing to walk is an important factor in any layout. During the heaviest shopping periods, walking as much as 1000 feet does not seem to bother shoppers, but, in general, 400 feet is the preferred maximum distance from car to buildings. There is some indication that shoppers will even pay a modest parking fee to be as near as 200 feet rather than use the more remote but free parking space. However, owners so far always have provided free parking although there have been some unsuccessful efforts to charge.

A relatively smooth bituminous or concrete paved surface is an essential for a good center. It must be well drained, and at least the perimeter drives should be lighted to ¼ foot-candles. Regional centers frequently light all parking to ½ or ¾ foot-candles average intensity.

Design of the Buildings . . .

The consulting engineer's concern with the buildings will start with the usually simple problem of the structural frame and grow in complexity with the mechanical and electrical work.

. . . Structural

The bay sizes are not fixed by economics. A 24-foot x 24-foot bay has worked quite well, and 24-foot x 48-foot may be better – but at an increased cost. Unprotected steel, with light roof construction, has been acceptable for the roof structure above the mall. At least one important center has used a wooden structure for both the basement and mall level framing, but the saving in cost, if any, was small. Framing below the mall probably should be of fireproof construction to satisfy codes and obtain lower insurance rates. Complete reinforced concrete framing – even precast – will have much appeal if the costs are right and if tenant changes can be eliminated or minimized.

. . . Electrical

Electrical systems in the buildings will vary, depending upon the extent of finish offered by the owner. An average of 10 watts per square foot will have to be supplied, but requirements vary from about 4 watts to 20 watts for the individual stores. The electrical engineer will have to size his main supply and substations so that the system can meet this wide range at any time that the lessee requires it. The minimum system can be designed to terminate in a panelboard within the tenant space, but the engineer must also design the auxiliaries of yard, planting, canopy and common facilities lighting, public-address, TV antennae, intercommunication, and fire and security systems. The owner may also want the engineer to design the complete store power and light systems.

. . . Mechanical

The mechanical consulting engineer faces a series of problems that are dependent, in large part, on the owner's leasing program. The least he will do is provide yard and roof drainage, be sure that sanitary main lines are available to meet a flexible tenant layout, and be sure that the structural design will permit installation of workable heating, ventilating, and air-conditioning systems. The mechanical design will be more complicated if the owner offers tenants finished areas ready to occupy. Then the individual store systems pose their own problems, the most severe having to do with the need for cooling towers, evaporative condensers, compressors,

and the provision of structural supports for these units. Roof structures for the mechanical work have given architects much cause for concern and forced engineers to search for better arrangements.

The engineer must always consider the efficiency advantages of the central plant, and these are frequently used in community and regional centers. Some centers have semicentralized air-handling units, using cooling media from a central plant.

The central plant for heating and cooling will cost less than the total of individual plants unless a very inferior quality of separate plant is selected. This centralization permits the use of cheaper fuel, pre-cooled well water, and heat pumps. Cooling towers can be consolidated, and this has the advantage of minimizing roof structures, but common towers require metering of cooling water, and this may not be popular.

One contractor, favoring the central plant, talks of producing extra owner income of 35 cents per square foot, but an analysis would not support this contention. Tenants pay their own operating costs directly for individual plants, so the owner generally gains little from the lower operating costs of the central plant unless he rents all space as air-conditioned or operates sizable facilities of his own.

Truck tunnel ventilation is important because of its influences on safety and its cost for construction as well as operation. Some tunnels provide no forced ventilation; others have complete systems for tempering and changing the air. Code authorities have given little thought to this because it is new; they think only in terms of enclosed garages.

Fire protection can vary from complete sprinkler systems, rate-of-rise and smoke alarms to nothing. Department stores and other large stores will generally require sprinkler protection. In any reasonable construction, the insurance saving on the building will not justify the sprinkler cost; however, the insurance saving on contents will. This is a design feature from which the tenant and not the owner benefits.

At some point, the engineer will be asked to explore the costs of a group of totally enclosed shops with covered malls and semi-open store fronts. Careful planning of the air use will be required, and the matter of fire protection as well as insurance rates must be studied.

Tenant Leasing

Many alternate plans for finishing the leased space to suit the tenant have been tried. No matter what the plan is, the consulting engineer is called upon to help in the establishment of the over-all program and individual negotiations.

A ready-to-occupy job, furnished and paid for by the owner, simplifies matters because the tenant will spell out his wishes and the owner agrees with or modifies them. The engineer can then proceed to design the mechanical and electrical work. Unfortunately, the cost to the owner is high.

Under a tenant allowance system, the owner gives the tenant a lump sum in money or a credit against his rent, then the tenant designs, builds, and pays for the finishing of his own space. The tenant allowance gives an agreed amount of money to pay for store front, ceiling, plaster, and electrical and mechanical work. This simplifies the owner's work vastly and minimizes his risk of encountering costly overruns. Combinations of these two plans also are currently in use.

Consulting engineers who have not had experience in the field of owner-tenant negotiations will be amazed at the immense amount of time he or his staff will spend on leasing activities. He must see that costs for the owner are reasonable, that extravagant tenant demands are resolved intelligently, and that a predetermined quality and performance standard is maintained. There is often a wide variance between features wanted and features acceptable. Only the engineer can resolve these differences properly.

The Future for Shopping Centers

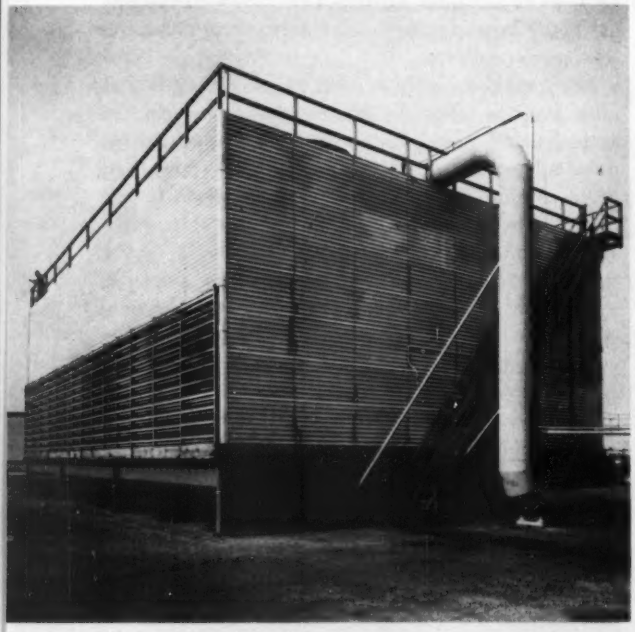
Construction of shopping centers has just begun, and many consultants will find this type of work providing a substantial part of their income in the future. However, many marginal, poorly conceived centers will find the going rough as new and better centers are built nearby. Downtown merchants are being hurt as suburban centers compete for the customer's dollar.

Municipalities, utilities, and all governing bodies must learn to recognize and treat shopping centers as real urban areas. Engineers – particularly those involved in city planning and zoning – must join those who are designing projects and see to it that the services and benefits available to downtown stores at little or no cost are also brought to the shopping center. Also, parking subsidies available in older urban areas must be extended to the new centers. Zoning and building codes will have to be modernized to cover shopping centers – both to control and to encourage their construction.

There is a resulting challenge just now making itself felt: How can we remake the old downtown commercial area again into an effective shopping center? Expressways ringing the district and reaching into the populated areas will call for superior engineering. Design of exits and entrances, great parking structures, freight-handling facilities, and modernized utilities, and the creation of a landscaped shopping mall to replace main streets, will keep consulting engineers busy for a long time.

When completed, Garden State Plaza, covering 145 acres, will be largest shopping center in the United States.

Garden State Plaza, Paramus, New Jersey



Cooling tower serves central refrigeration plant containing two compressors totaling 4500 tons.

Abbott, Merkt & Company, Inc. — Architects-Engineers

Moran, Proctor, Meuser & Rutledge — Consulting Engineers, Foundations

Hazen & Sawyer — Consulting Engineers, Flood Studies & Sewerage Plant Design

GARDEN STATE PLAZA, Bergen County, N. J., will be the largest shopping center in the United States. Even today, with Stage One completed and Stage Two opening October 1958, Garden State Plaza is larger than any other regional shopping center open to the public in the East.

The Planning Stage

Planning was started in November 1951, building construction was started August 1955, and the center was opened in May 1957.

Nearly 145 acres of land were acquired for the project, the equal of about 48 city blocks. Approximately 110 acres are being used at present for the

center. The remainder is undeveloped except for a large and active drive-in theater.

Site preparation involved bringing 1-million cubic yards of fill to the property, spreading this earth, and thoroughly compacting it under rigid engineering control. A 25-ft wide stream, carrying 12 feet of water at flood stage, was moved from the center of the building group into a new channel, ¾-mile long and 500 feet away. At flood stage, storm water drainage can be pumped by two automatically operated stations. A complete sewage treatment plant had to be built. A private access road ¾-mile long was built to tie together a network of major express and arterial highways, and provision was made, by negotiation and land acquisition, for construction of a complete overpass for State Highway No. 4, should it ever be required. Gas and water lines bordered the site.

Structural Details

The building frame is of structural steel, and is fireproofed below the mall and throughout the two large stores. Bay sizes are 25 x 25 feet in the department store, and 24 x 24 feet elsewhere – except for 48-ft spans in the tunnel.

The truck tunnel is built below the mall level, and, with its series of 6- and 8-ft wide freight corridors, serves for both receiving and delivery of all merchandise. It is 32-ft wide, between two 8-ft platforms; it is well lighted and ventilated.

The exteriors above the canopies are of bright-colored, porcelain-enameled, prefabricated and insulated panels. Below the canopies the tenants' own architects have created a wide variety of attractive store fronts, in harmony with the over-all decor. There are about two miles of store fronts in the center, the equivalent of about 40 city blocks.

A central heating and air conditioning plant is buried in the heart of the project. There are three large and one small high-pressure boilers, having a total capacity of 2810 boiler horsepower. All heating is done by high temperature (350 F), high pressure (250 psi) hot water. This is one of the largest units of its kind, and is the first time this unusually efficient high temperature hot water system has been used for retail stores.

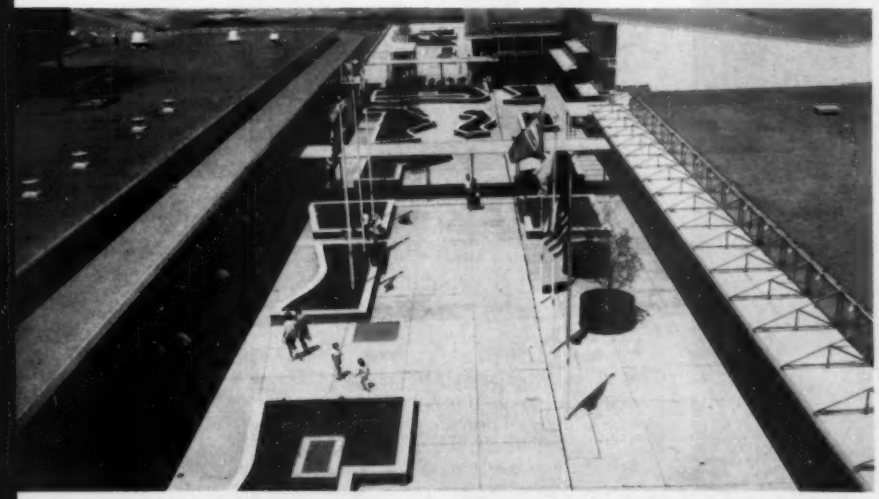
There are 4500 tons of refrigeration, in two compressors. The central plant space allows for future additional expansion to 4550 boiler horsepower heating capacity and a total of 9000 tons of refrigeration. The hot and chilled water is metered and sold to each tenant. The Bamberger store system employs a high velocity, high pressure, air distributing system to keep duct sizes to a minimum.

Electric Service

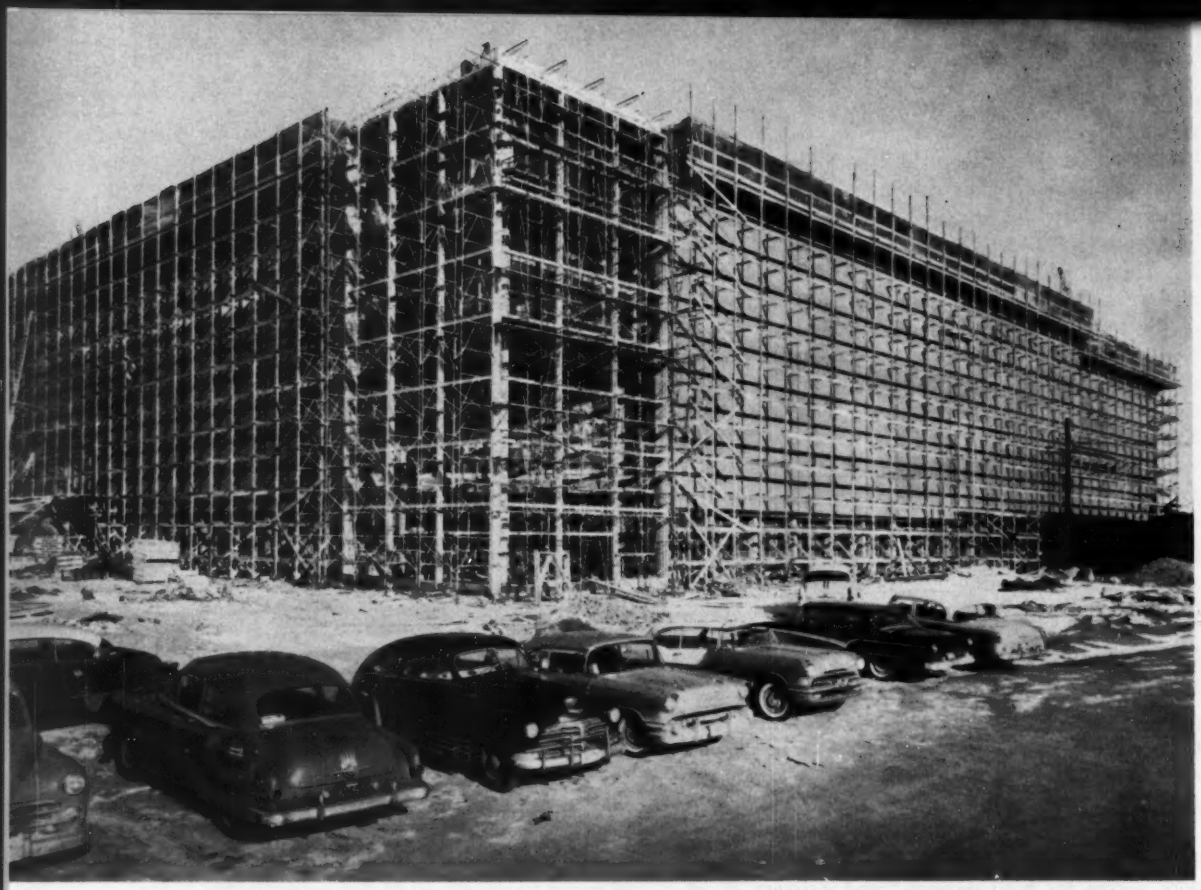
Electric power, totaling 16,200 kva, is provided by Public Service; 7500 kva is brought in overhead at high voltage to the center's own outdoor substation. From here it is taken underground to serve the central plant, supply power for all parking, and mall and canopy lighting. The tenant load of 8700 kva is distributed directly by Public Service to transformer vaults built in the lower level, thence to meter rooms for all tenant connections.

A public address system, mounted in the canopies, broadcasts music and announces special merchandising messages or items of public interest.

The asphalt-paved parking area has a capacity of 7000 cars; it can be expanded easily to hold 11,000. The parking area is well lighted by mercury vapor floodlights on 60-ft towers. It has its own system of marginal roadways, with 17 entrances and exits connecting with four main access roads.



Banner Court is typical of attractive mall layout used in design of Garden State.



The Jordan Marsh department store, with a floor area of 247,000 sq ft, is the largest structure in the Center.

Northshore Shopping Center, Peabody, Massachusetts

John Graham & Company — Architects-Engineers

NORTHSHORE is a large regional shopping center located 16 miles from the center of Boston.

It has a paved parking area covering 3,482,400 sq ft with stalls for 8500 automobiles and will have close to 1.2 million sq ft when all phases of the project are completed.

The center's market area (not including the corporate Boston population of 801,500) is 1,557,600

The 48-in. Escalators can handle 8000 persons per hour in Jordan Marsh building. Note sprinkler system which can provide protective water curtain.

Roof construction is steel decking on joists and girders supported by steel columns.

persons in 458,955 families, with an average income of $5360 per family. These customers spend annually more than $1.5 billion in retail stores.

The major department stores at Northshore are Jordan Marsh, with a basement and three floors (247,000 sq ft, of which 60,000 sq ft are at the mall level), Filenes, with a basement and two floors (117,000 sq ft), and J. J. Newberry with a basement and two floors (105,000 sq ft). A truck concourse below grade serves all of these stores.

Civil Engineering

After selection of the site for Northshore, borings indicated that a troublesome high water table was to be expected for the site slopes up dome-like toward the area chosen for the buildings. However, when the excavations were made for basements, a penetration of a substrata layer must have occurred, for the water table fell far below the level the borings indicated and gave no trouble.

No storm sewers were on the site, so the center had to install its own reinforced concrete culvert pipe and lead it for almost a mile to Proctor's Brook for run-off. During this run, the pipe varied in size from 36 in. to 60 in. It passed under a railroad and Highway 128.

Mechanical Engineering

The steam-generating plant consists of four main fire tube boilers, one summer boiler burner unit, and one waste heat boiler. The maximum steam output is 2120 boiler hp. This steam plant distributes low-pressure steam with pumped return for space heating, domestic hot-water heating, and kitchen fixtures for approximately 50 different tenants. Each tenant is provided with a condensate meter to measure the amount of steam used.

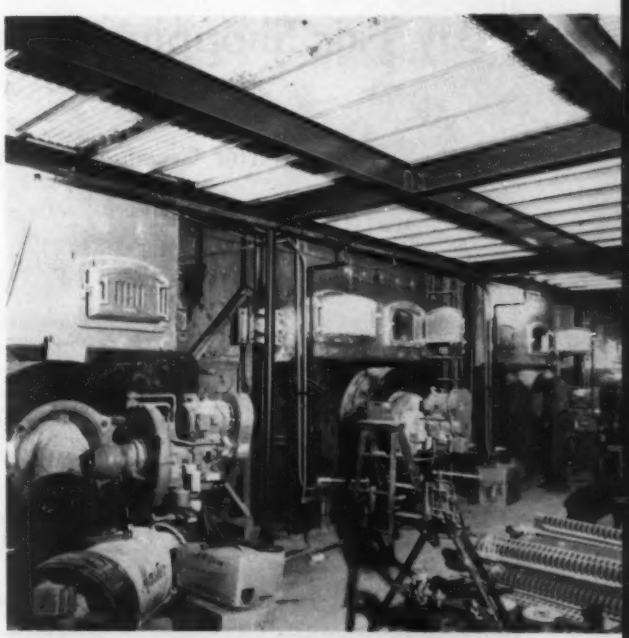
The project provides a rubbish collection service whereby the rubbish from each tenant's space is carried to an incinerator in the steam plant. The heat released by the burning of the rubbish is partially converted to steam in the waste heat boiler.

The center is completely equipped with sprinklers for fire protection, a fire-alarm system, and a public-address system.

Special Problems

A center of this scope has several built-in difficulties. The removal of storm water from its tremendous roof area and parking lot expanses is one. The change in dimension of the buildings during a 100 F change in temperature is another. Compensation is accomplished by the use of all-weather expansion joints.

This far north in New England, snow removal also becomes a major maintenance problem. Removal of snow from the mall is accomplished through hatches opening into the underground truck concourse. Snow on the parking area is removed by the center's own bulldozing and sweeping equipment.



Central boiler room supplies metered low pressure steam for space heating and domestic hot water.

Bay Fair contains a 160,000 sq ft Macy's department store, a 30,000 sq ft food market, and 22 other stores.

Bay Fair Shopping Center, San Leandro, California

Victor Gruen Associates, Inc. — Architects-Engineers

Dudley Deane & Associates — Mechanical & Electrical Engineers

CONSTRUCTION WORK on one of the most unusual regional shopping centers in the United States — Bay Fair Shopping Center in San Leandro, Calif. — now has passed the halfway mark. The center, a joint undertaking of the Capital Company and Macy's, is planned for an ultimate development of 650,000 sq ft of retail space. Recently completed, Stage One is made up of the 160,000 sq ft Macy's department store, a 30,000 sq ft food market, and 22 other smaller stores.

The unusual feature of this regional center is its two-level design, which provides for compactness, reduces walking distances, and induces an atmosphere congenial to shopping.

Parking for 3600 cars is segmented into two levels, bringing shoppers in at each level. Vertical connections between levels within the shopping center are well located and include escalators, stairs, and ramps. Canopies connect all buildings to protect shoppers during inclement weather.

Structural Details

Walls of Macy's building are of architectural concrete with reinforced concrete girders, beams, and columns. Prestressed concrete girders and prestressed concrete roof structure are used for the market. Floors and roof are of reinforced concrete waffle slab construction.

Tenant buildings also have reinforced concrete girders, beams, and columns. Walls are concrete, metal studs, plaster, and brick — with glass store fronts. Floors are reinforced concrete waffle slabs

with 2-in. lightweight concrete toppings. Roofs also are reinforced waffle slabs with built-up composition roofing. Fiber board (1 inch) over the concrete slab serves as insulation. Partitions are steel studs and plaster. Stairways are steel pans with concrete fill.

Wall finishes are either painted architectural concrete, precast concrete panels, brick, ceramic tile, or plaster. Ceilings have been covered with suspended plaster and acoustic tile.

Heating and Air Conditioning

Central plants generate hot and chilled water for heating and air conditioning. The individual fan units have chilled-water and hot-water coils and high-velocity cleanable filters. The main hot and chilled water services are run through primary bypass loops for each tenant. Temperature controls make use of a room thermostat and one three-way mixing valve for each service. When heat is required, the valve opens and an auxiliary switch starts a secondary circulating pump positioned between the mixing valve and the heating coil. This circulates hot water at a constant rate through the coil; the temperature of the water is modulated by the positioning of the mixing valve. When cooling is called for, a similar series of operations take place in the chilled-water system.

Water is chilled at the central plant to 45 F, and it returns at 57 F under maximum design conditions. The hot water, at maximum design conditions, leaves the plant at 240 F and returns at 140 F.

Hot and chilled water is metered only to the major tenants or special users such as food markets, drug stores, and restaurants. The remainder of the tenants are charged on a square-foot basis.

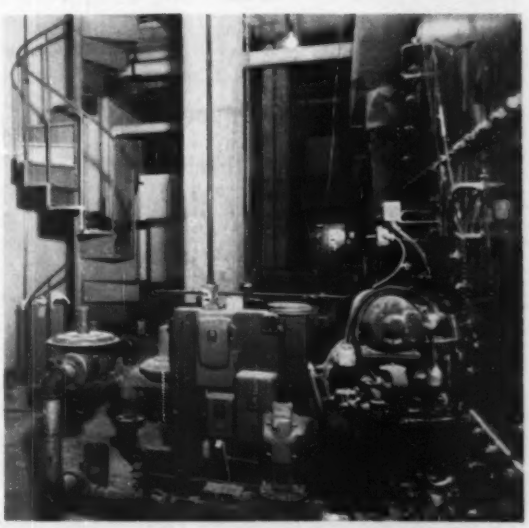
Macy's structure is air conditioned by a combination high- and standard-velocity type air-handling system. Inside temperature is maintained at 72 to 75 F. The maximum velocity in supply ducts ranges from 3600 to 4000 fpm. These ducts reduce the floor-to-floor height by 18 to 24 in. By using high velocity, the vertical duct shafts were made smaller than usual, thus providing additional area for sales and storage.

Bay Fair features the first use of a variable air quantity air conditioning system. Air can be varied upward from 50 percent of total capacity on both the heating and cooling cycles. The designed setting is 75 F, and any increase or decrease from this setting varies the quantity of the air over this 50-100 percent range. The most important feature of the new system is that by using variable air quantity, the power saving for Macy's will be about $4000 a year. Variable-speed fans are driven by electromagnetic couplings, the first time this type of drive has been applied to air conditioning.

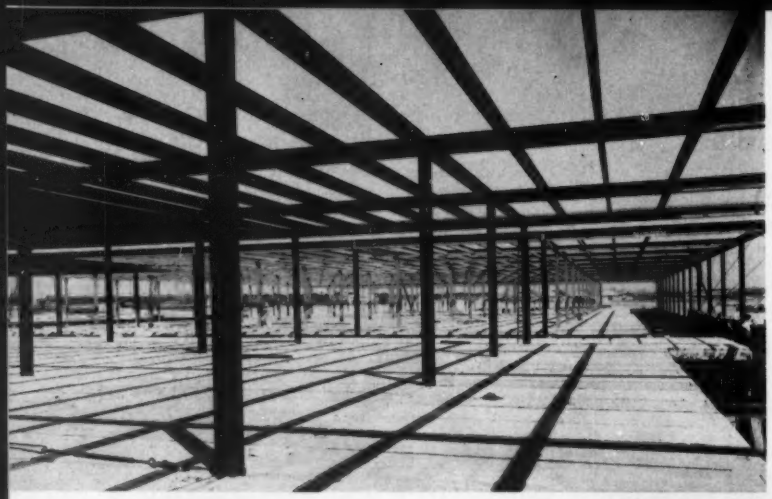
Refrigeration equipment consists of three open-type centrifugal water-chilling units with capacities of 200 tons, 460 tons, and 1080 tons. The refrigeration machines are arranged so that there are eight combinations of operation, permitting an efficient loading at 50 percent capacity or more on all operating machines through the full range of load requirements. Effective minimum capacity of total system is 100 tons (50 percent of the smallest machine). This is slightly more than 5 percent of the total installed capacity. Approximately 2000 hp is required to operate the air conditioning system at full capacity.

Power Distribution

An interesting feature of the shopping center is the system of master meter electrical power distribution. Electrical power is purchased from the Pacific Gas and Electric Co. at 12,000 volts and distributed to five substations within the shopping center where it is stepped down to 120/208 volts. Low voltage is distributed to plug-in bus duct for maximum flexibility. The services to individual tenants are taken from the bus duct and metered at the premises. The tenants pay the same rate they would if power was purchased directly from the power company. This gives the owners the advantage of securing power at low rates for their own building, and the power sold to tenants provides additional income. If the stores are changed, the distribution system need not be changed; all that is necessary is to plug in a new circuit-breaker and add the new service. The maximum anticipated power requirement is 6000 kva.



All buildings in the Bay Fair Center are heated and cooled by equipment in this central plant.



Engineers used 4-ft x 16-ft precast floor panels in design of Roosevelt Field shops.

Aerial photo shows highway approaches and parking space provided for 11,000 shoppers' cars.

Roosevelt Field Shopping Center, Long Island, N.Y.

Syska & Hennessy — Consulting Engineers, Mechanical & Electrical

Severud-Elstad-Krueger — Consulting Engineers, Structural

Moran, Proctor, Meuser & Rutledge — Consulting Engineers, Soils & Foundations

I. M. Pei & Associates — Architects

Brugnoni & Boehler — Associate Architects

H. Abe Feder — Consultant, Lighting Effects

Peter Carver & Associates — Consultants, Mechanical Design for Ice Rink

Wilbur Smith — Traffic Engineer

Skidmore, Owings & Merrill — Architects for R. H. Macy & Co.

AT ROOSEVELT FIELD, the site of Lindbergh's take-off for his famous flight, one of the largest shopping centers in the nation is opening for business this summer. With more than 130 acres of retail space, the center serves the heavily populated area of Long Island's Queens, Brooklyn, Nassau, and Suffolk counties.

The stores, centered around R. H. Macy & Co.'s largest suburban facility, form a compact cluster landscaped with fountains, trees, and flowers. Parking space is provided for 11,000 cars.

Well Water Supply

The center is supplied by four wells, each over 300-ft deep and having a capacity in excess of 1200 gallons per minute. After use, the water is disposed of in a recharge basin occupying four acres in the southwest corner of the shopping center site, for Long Island law requires that all well water be returned to the ground.

Chilled water from the wells is piped through the continuous basement and used by many of the ten-

The mall at Roosevelt Field Shopping Center is decorated with a series of pools and fountains.

ants in their air conditioning systems. Air distribution equipment is located in an enclosed mezzanine. Provision has been made to permit extension of facilities in any future expansion programs.

Flexibility of Design

The entire center was designed to afford the tenants maximum opportunity to adapt the stores to their needs. In addition to selecting their own air conditioning and heating, the tenants can add ductwork, stairways, or conveyor systems to the basement merely by omitting precast floor panels. The entire center was designed for the use of 4-ft x 16-ft precast concrete panels.

The precast panels with standard reinforcing bars could not be used for the long spans over the truck tunnel, so similar but prestressed panels are used in these areas. Wires having an ultimate strength of 240,000 psi made up the ⅜-in. pretensioned strands, anchored throughout their length by bond with the concrete.

Basement and Truck Tunnel

A continuous basement, 1300 feet by 700 feet, contains 25 additional shops, several rest rooms, administrative offices, a radio broadcasting studio, a 400-seat meeting room for community use, a home building products display room, and an art center.

All freight is received through a continuous truck tunnel. In addition to a sprinkling system, the tunnel also is provided with sufficient ventilation for carbon monoxide control.

An ice-skating rink, opened in February, is used during the summer season as a kiddieland or a roller skating area.

Peter Carver designed the mechanical aspects of the rink, with piping imbedded in the concrete flooring. A centrifugal compressor is used for cooling. Located in a basement about 70 feet away from the rink, the compressor is designed so that it can be used as part of the air conditioning system during the summer season.

Utility Services

All domestic water supply lines, sewers, and condenser water lines are provided with numerous capped connections which serve as outlets to the various tenant facilities. The Long Island Lighting Co. also was given permission to extend their services, on an individual basis, to the center's tenants.

Mall fountains use domestic water supplies, with 2200 gallons per minute used on a recirculating basis. In winter, the water is tempered by special heating units. The fountains, with dimmer lights, show constantly changing variations of three primary colors.

The malls, designed in a modular pattern to blend with the buildings, are paved with sound reducing 9-in. hexagonal asphalt blocks, ground to expose the bluestone aggregate.

Prince Georges Plaza,

ONE OF THE BASIC aims in building a shopping center should be to accommodate a variety of tenants economically.

Because many shopping center buildings are planned and built prior to leasing agreements with various tenants, flexibility is all important. Often after leases are signed the tenant decides he wants additional space or a different location. With a flexible arrangement these changes can be made economically. Without flexibility the owner can be put in an unfavorable negotiating position.

An example of flexibility in design is the Prince Georges Plaza, a regional shopping center covering 60 acres, with parking facilities for 5000 cars. The center has 750,000 square feet of floor space.

Deliveries to individual shops are through a truck tunnel, which is also a secondary exist and a conduit for electric wiring and sanitary and storm sewers. Transformer vaults in the tunnel area step down 13,000-v primary distribution to 265/460-v secondary. Using this tunnel as a giant pipeshaft, most utilities can be serviced without entering the tenant space. Whether the tenant has a 20- or a 60-ft store makes no difference.

Utilities for the Center

The center provides gas for heating and for restaurant facilities. Gas is brought to one or two meter rooms in each building, then distributed from that point to the various stores. Whether a tenant has a small or a large store does not affect the service, and changes can be made simply and accurately.

Air conditioning is on a noncentral basis; that is, each tenant has his own air conditioning plant. In many centers, this has the advantage of permitting the mortgage on each building to be handled by a

Buildings cover 750,000 sq ft of the 60 acre site of the Prince Georges Plaza, in Maryland Parking space is provided for about 5000 cars.

Sidney W. Barbanel – Mechanical Engineer

Leon Selzer – Structural Engineer

Greenhaut & O'Mara – Site Engineer

Lathrop Douglass – Architect

Hyattsville, Maryland

different company, and this simplifies the negotiation of real estate transactions.

Cooling towers for these air conditioners will be on the roof of each building, enclosed by a facing only, without a roof, and with the sides open approximately four feet from the building roof deck. The towers can be mounted on a pair of I beams in this area. Since the space is on the roof and available to all, this design can handle the air conditioners whether a tenant requires a small or large area.

Flexible Utility Rooms

For the most part air conditioning equipment is located in the basement. Each bay, one bay back from the rear of the stores, is framed for duct shafts and piping. By putting in this additional framing, the basement machine room can accommodate store widths of from one to four bays. Toilet ventilation and vent stacks also are carried in this shaft.

The soil line is run the full length along the back of the building. Water is piped around the entire shopping center in a loop to serve hydrants as well as the possible addition of toilets in the future.

Space for Expansion

Flexibility for any future expansion is generally by space allocation rather than equipment – for many such proposed expansions never take place. For example, if you provided a compressor to air condition a 200,000-sq ft store area, with provisions to add an additional 100,000 square feet later, one-third of your compressor capacity would be for future use. If the future expansion did not take place for 10 or 15 years, the equipment would be nearly obsolete. The additional money originally spent for more capacity would have been largely wasted.

The 105-acre site for Eastland provides over 75 acres for parking. Diagram (p. 103) shows layout.

Eastland Center, Inc., Detroit, Michigan

Hyde & Bobbio, Inc. — Mechanical & Electrical Engineers

Victor Gruen Associates, Inc. — Architects - Engineers

WHAT IS THE engineer's role in the design and construction of a major shopping center? Experience in connection with the Eastland Center, in Detroit, provides a good example. This large regional shopping center is owned by the J. L. Hudson Company, a Detroit department store, and it was designed by Victor Gruen. A separate professional engineering contract was made directly with the owner.

Engineering Fee

The engineer's fee was established as a percentage of the construction costs and was in accordance with the Michigan Society of Professional Engineers' recommended schedule. The contract included studies, reports, design, and supervision of the installation work. Monthly progress payments were made on a payroll plus overhead basis.

During negotiations for the engineering contract, the general scope of the work became apparent. At that time the architect already had established his preliminary design and was waiting for mechanical and electrical information.

The architect's drawings indicated a site containing 105 acres laid out for:

7 parking lots and roads	over 75 acres
Lawns and landscaped areas	14 acres
1 four-story department store (J. L. Hudson Co.)	478,600 sq ft
1 two-story building (one tenant)	31,800 sq ft
1 restaurant building	28,700 sq ft
5 single-story tenant buildings (71 tenants)	546,300 sq ft
Total building area	1,085,400 sq ft

A subgrade truck tunnel with receiving and shipping docks was included in the design. It serves all tenants at basement level.

Mechanical Studies

The owner requested studies comparing a central steam and chilled water plant with unit plants for each building and with unit plants for each store. A central plant proved to be the most feasible when studied on an owning and operating basis, particularly in the light of the owner's intention to permanently own and operate the center.

The study also indicated the practicality of two types of all-air systems. One system was based on intermediate size units, each selected to serve a complete building with separate zone control for each tenant. The second made use of two massive units and distribution ducts – one to serve the large department store and the other to serve the remaining tenants. The two large plant designs turned out to be more attractive to the engineers. However, both schemes failed to receive the owner's approval for the tenant buildings, particularly the second scheme, for individual tenant metering could not be worked out satisfactorily.

Finally a system of small conditioners for individual stores was approved. Perimeter heating was designed on a building by building basis, with entrances warmed by entry type unit heaters. The study, however, was worth while for it facilitated subsequent procedures. Insight into the owner's desires was gained more quickly than would have been possible in any other manner. Thoughts on standardization of equipment and operating procedures grew where none had existed before.

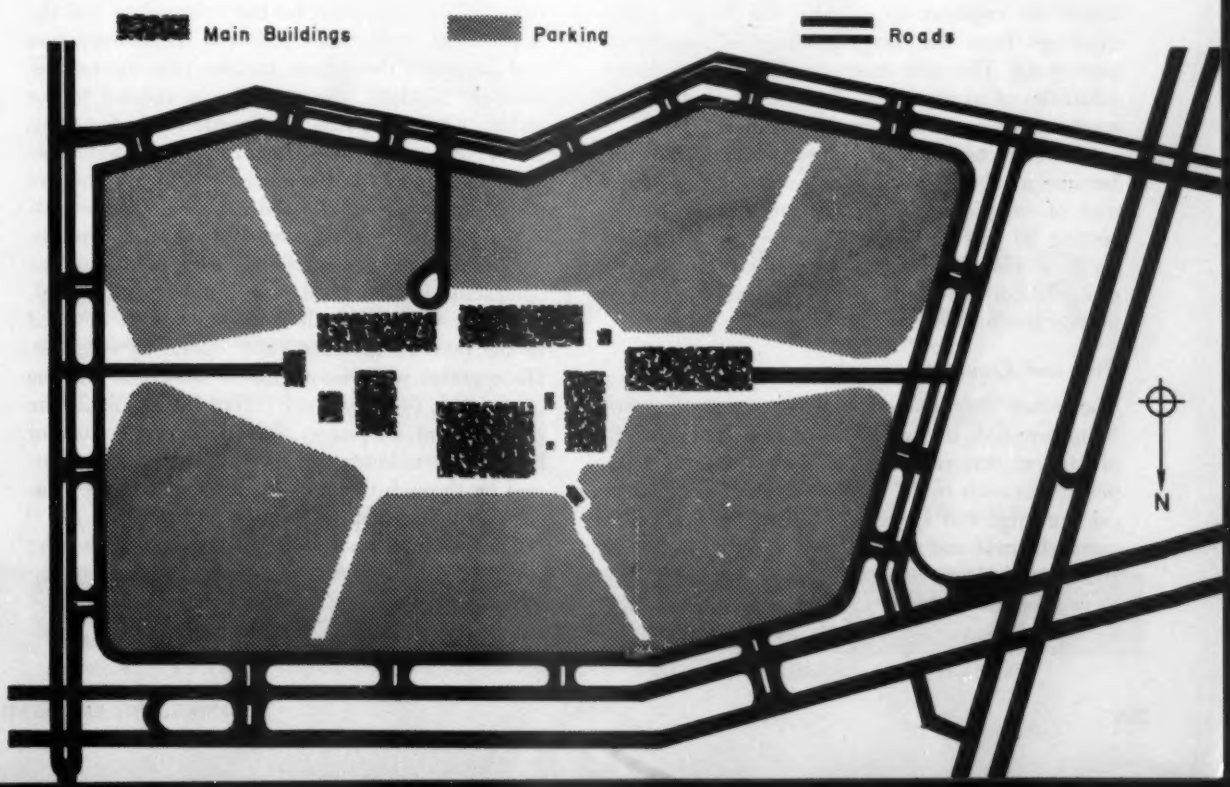
Preliminary Design

While the mechanical studies were being made, plumbing, fire protection, and electrical preliminary design work got under way. The owner and architect had brought together key personnel previously employed on all phases of shopping center design, construction, and operation and had made them available in teams for consultation. These men provided information that was analyzed by the engineers and incorporated in their design. The result was a comprehensive set of preliminary drawings and specifications which, in turn, were submitted to all members of the owner's teams for comment and criticism.

Working Drawings and Specifications

Engineering forces who had produced the mechanical and electrical preliminary drawings and specifications consisted of five senior engineers, five draftsmen, and occasional clerical help. It became evident that this small force would have to be increased to keep pace with the architects, who by this time had begun their working drawings. The staff was increased progressively until 30 people were employed.

Aids to coordination were evolved. The separate offices of owner, architect, and engineer were interconnected through extensions from one telephone switchboard. A regular schedule of conferences, progress meetings, and reports were initiated and



DATA ON ENGINEERING WORK

Construction Costs

Mechanical Trades Contracts	$ 8,800,000
Electrical Trades Contracts	3,600,000
Total	12,400,000

Number of Drawings

Mechanical and Electrical Drawings	450
Contractors' Field Drawings (estimated)	400
Total	850

Engineering Time in Man-Hours

Study Time	4,506
Preliminary Design Drawings	7,800
Preliminary Specifications	553
Working Drawings	40,716
Working Specifications	1,200
Field Supervision	10,331
Checking Shop Drawings	2,186
Revision Work	823
General Clerical Work	4,881
Total Engineering Time	72,996

maintained. Procedure on obtaining design data from lessees was organized with the owner's leasing department, one man in each office acting as the focus for all tenant information and as the arbiter of all lease agreements.

The specifications for the utility plant equipment were the first completed. These were issued for bids and prepurchase approximately five months before the general trades work started. This enabled the engineer to prepare the final working drawings from the shop drawings of the actual equipment. This also insured satisfactory delivery schedules of major items. The structural steel contract was executed in a similar manner.

As architectural and structural working drawings became available, the owner pressed for a stated time of completion. Therefore specifications representing 80 percent of the final work were put out for bids. The specifications were of the closed type designed for base bids, with substitution forms to permit alternate equipment proposals.

Bids and Contracts

The owner required competitive, separate, prime lump sum bids instead of negotiated bids. The list of bidders was restricted to about four top competitors in each trade. The mechanical and electrical drawings and specifications had been made as comprehensive and as detailed as possible so that no one would have to guess at what was required. This served to put all bidders on an equal footing and prevented accidental omission of some elements of the work. The owner received the bids and opened them with the engineer. A week was taken to analyze and negotiate a precontract addendum to provide for certain price reductions. Final recommendations were then made and assistance was provided in preparing contracts for signature. The contracts were separate for each major trade.

Construction and Supervision

With the signature of the separate prime contracts, the owner became the coordinator of all work. This was accomplished with a relatively small but efficient staff. The owner's superintendent of properties was directly and actively in charge.

Engineering supervision originally was intended to be the inspect and report type, but as the work progressed the missing 20 percent became important, and field decisions were necessary. Two engineers were assigned permanently to the site. They were supplemented with men from the design group as the work volume required.

The designers continued to produce drawings for the balance of the tenant stores finishing work. These were issued in groups of five or ten at a time for pricing. The designers also prepared all corrective bulletins and subsequent work orders. Field orders were kept to a minimum and were ultimately incorporated in work orders. The field engineers watched all pricing and contract changes and were responsible for certification of monthly payments to the contractors.

Occupancy and Operating

The owner previously had established at the site his operating personnel for the utility plant and the department store. They followed the construction and prepared themselves to take over operations. On July 26, 1957, the project was opened to the public. The stores had been made ready for occupancy on schedule. However, a considerable amount of mechanical and electrical work was yet to be done, particularly the balancing and adjusting of the air conditioning systems and controls. Preliminary adjustments had been made by the contractor in accordance with the specifications, but after occupancy all complaints were directed to the owner's assistant chief operating engineer. He, together with the engineer's field men and the contractors, reviewed each complaint and made the readjustment necessary. This organized system of handling complaints and final adjustments was carried on through two seasons, after which the owner's personnel accepted full responsibility.

The last and final step will be an engineering study of the post-adjustment heating and cooling operating costs based on the owner's records.

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WRITE FOR BULLETIN TC 406A

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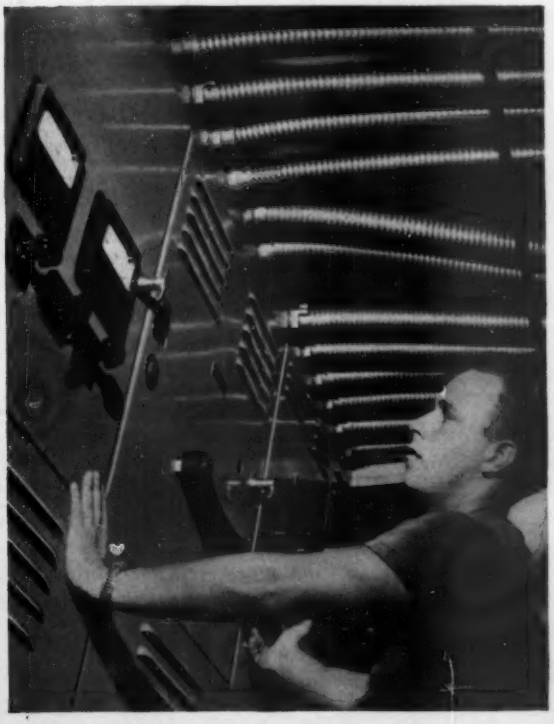

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PAUL R. LUTZ
Day & Zimmermann, Inc.

Paul R. Lutz received his Bachelor of Science degree in Mechanical Engineering from the University of Pennsylvania in 1925. Before coming to Day & Zimmermann, Inc., Mr. Lutz was a production planner with General Electric Co., an assistant mechanical engineer at The York Heating and Ventilating Corp., a research engineer at Hall Electric Heating Co., and mechanical engineer with Badenhausen Corp. Mr. Lutz came to Day & Zimmermann in 1935 and has done project engineering on new plants for American Viscose Corp.; Esso Standard Oil Co.; and Linde Co., Division of Union Carbide. He began his studies of fluid friction in pipes in 1942, making charts of steam and water friction. With experience gained from setting up a series of steam pipe size charts, he has devised his tables for stack selection.

CE exclusive

THE ENGINEERING determination of the diameter and height of stacks and chimneys always has been a complicated problem because the designer is dealing with a great number of variables. Some approaches to the problem of stack sizing, to avoid complexity, eliminate factors necessary for the complete analysis and make assumptions of questionable validity. The influences of weather, temperature, and altitude make accurate calculations difficult, since much of the data are uncertain.

Stack Sizing

In particular, engineers have lacked precise friction coefficients.

It is possible, however, to overcome the limitations of the extremely simplified approach and also avoid the involved methods that attempt to account for all influences. This can be done by the incorporation of basic pipe friction data in tables.

Although many satisfactory stacks have been designed using a fixed friction coefficient, actually there is a wide variation of the applicable coefficient over the range of diameters and capacities of stacks. The basis for these tables is "Friction Factors for Pipe Flow," a compilation of experimental data, by L. F. Moody, *Transactions* of the ASME, November 1944.

From this information, graphs of friction in commercial steel pipes were set up for varying diameters and flows. Lines for velocity head were then superimposed on the friction curves so that one point on a graph represented diameter, flow, friction, and velocity head – for a single temperature and pressure.

Tabulations then were made of data taken from the plotted curves for friction and velocity head. Other atmospheric and temperature conditions are accounted for by use of simple but accurate coefficients. No compromise has been made in the interest of simplicity, and precise answers for any combination of conditions can be obtained quickly.

Flue gas density was taken as equivalent to air after calculations based on products of combustion from coal and oil showed unimportant differences. Flue gases from the combustion of unusual fuels may require a density correction.

Theoretical draft also has been tabulated for various temperatures, at sea level and 29.9 in. Hg barometer. Higher altitude and decreased barometer mean reduced draft. Figures for other elevations and weather in terms of subnormal barometer are tabulated to allow determination of draft for many combinations of conditions. In addition, a tabulation of calculated theoretical drafts, for a number of common conditions, is included.

Theoretical Draft

Outside air temperature – Use 100 F or more for peak load in hot weather rather than 62 F.

Average gas temperature in the stack – Determine the flue gas temperature at peak load from the

TABLE 1 — THEORETICAL DRAFT
At Sea Level and 29.9 in. Hg Barometer

Average Gas Temperature Inside Stack degrees F	*Outside Air Temperature* 100 F	62 F
	Draft in. wg	
250	0.29	0.37
300	0.36	0.46
350	0.42	0.52
400	0.475	0.58
450	0.52	0.63
500	0.57	0.67
550	0.61	0.715
600	0.65	0.75

Influence of Weather and Altitude

The drafts tabulated above are subject to reduction due to bad weather, and also above-sea-level altitudes. Their influences may be determined by multiplying the tabulated drafts by the following factors:

Weather Influence

Subnormal in. Hg	*Barometer Factor*
0	1.0
1½	0.95
3	0.90

The above factors are related to a 29.9 in. Hg normal barometer, e.g., (29.9 — 1.5) ÷ 29.9 = 0.95. This may be used as factor for any normal barometer. (Do not use these factors for Table 3.)

Altitude Ft Above Sea Level	*Influence Altitude Factor*	*Combined Altitude and 0.95 Weather Factor*
1250	0.955	0.907
2500	0.91	0.865
5000	0.82	0.779
7500	0.75	0.712
10000	0.68	0.646
12500	0.625	0.594
15000	0.57	0.541

TABLE 2 — RESULTANT THEORETICAL DRAFT
in. wg per 100 ft height

For 0.95 Weather Factor, 100 F Outside Air and Various Gas Temperatures and Altitudes

Average Gas Temperature degrees F	*Altitude* Sea Level	1250	2500	5000
		Factor		
250	0.276	0.263	0.251	0.226
300	0.342	0.326	0.311	0.280
350	0.399	0.381	0.363	0.327
400	0.451	0.431	0.411	0.370
450	0.494	0.471	0.449	0.405
500	0.542	0.517	0.493	0.444
550	0.579	0.553	0.528	0.475
600	0.617	0.589	0.562	0.507

boiler or other equipment served by the stack. There will be a temperature drop between equipment outlet and stack inlet because of uninsulated breeching and air leakage; an unlined steel stack will cause a further temperature drop. These drops should be calculated; they may total 50 F to 150 F. Insulation should be provided and leaks sealed to minimize this temperature drop, especially for a natural draft stack.

Theoretical draft per 100 ft height (sea level and 29.9 in. Hg barometer) – Use Table 1 with outside air and average stack temperatures.

Example: For 500 F average inside stack temperature, and 100 F outside air temperature, the draft is 0.57 in. wg per 100 feet of stack height.

Weather and altitude influences – Select the applicable factors listed in Table 1. Three in. Hg barometer depression is considered common in

TABLE 3—VELOCITY HEAD (VH) AND FRICTION (Fr)
Related to Gas Quantity and Diameter for 500F*, Sea Level*, and 29.9 in. Hg Barometer*

Thousand Lb/Hr		Inside Diameter, Feet																		
		1.5	2	2.5	3	3.5	4	4.5	5	6	7	8	9	10	11	12	13	14	15	17.5	20
10	VH	0.18	0.06																		
	Fr	0.20	0.05																		
20	VH	0.72	0.23	0.09	0.04																
	Fr	0.80	0.18	0.07	0.03																
30	VH		0.50	0.20	0.10	0.055															
	Fr		0.40	0.14	0.06	0.03															
40	VH		0.90	0.35	0.17	0.10	0.06														
	Fr		0.70	0.22	0.10	0.05	0.025														
50	VH			0.55	0.27	0.15	0.09	0.056													
	Fr			0.33	0.15	0.07	0.04	0.02													
60	VH			0.80	0.40	0.21	0.13	0.08	0.05												
	Fr			0.45	0.20	0.10	0.055	0.03	0.02												
75	VH			1.25	0.60	0.33	0.20	0.13	0.08												
	Fr			0.65	0.30	0.15	0.075	0.043	0.03												
90	VH				0.88	0.49	0.28	0.19	0.114	0.06											
	Fr				0.40	0.20	0.11	0.06	0.04	0.016											
100	VH				1.10	0.60	0.35	0.22	0.14	0.07											
	Fr				0.50	0.25	0.13	0.07	0.047	0.02											
125	VH					0.94	0.55	0.35	0.22	0.11	0.06										
	Fr					0.36	0.19	0.11	0.07	0.03	0.014										
150	VH					1.20	0.78	0.50	0.32	0.16	0.085	0.05									
	Fr					0.50	0.25	0.16	0.09	0.04	0.019	0.01									
175	VH						1.10	0.69	0.43	0.21	0.12	0.07									
	Fr						0.33	0.21	0.12	0.05	0.025	0.015									
200	VH						1.40	0.90	0.57	0.28	0.15	0.09	0.06								
	Fr						0.42	0.27	0.15	0.064	0.03	0.02	0.01								
250	VH							1.40	0.88	0.44	0.24	0.135	0.09	0.06							
	Fr							0.40	0.22	0.075	0.043	0.028	0.013	0.01							
300	VH								1.30	0.64	0.34	0.20	0.13	0.08	0.06						
	Fr								0.30	0.13	0.06	0.035	0.02	0.012	0.007						
350	VH									0.82	0.46	0.27	0.17	0.12	0.08						
	Fr									0.17	0.08	0.05	0.025	0.02	0.01						
400	VH									1.12	0.60	0.35	0.22	0.15	0.11	0.07					
	Fr									0.22	0.11	0.06	0.03	0.02	0.01	0.008					
500	VH										0.94	0.55	0.35	0.22	0.16	0.11	0.083	0.062			
	Fr										0.16	0.09	0.045	0.03	0.02	0.012	0.008	0.005			
600	VH										1.32	0.80	0.50	0.32	0.22	0.16	0.12	0.088	0.07		
	Fr										0.22	0.12	0.065	0.04	0.025	0.016	0.012	0.007	0.005		
700	VH											1.10	0.66	0.45	0.30	0.22	0.16	0.12	0.093	0.05	
	Fr											0.17	0.08	0.053	0.033	0.022	0.014	0.01	0.007	0.003	
800	VH											1.40	0.83	0.60	0.40	0.28	0.20	0.16	0.12	0.066	
	Fr											0.21	0.11	0.067	0.04	0.03	0.02	0.013	0.009	0.004	
900	VH												1.10	0.72	0.50	0.36	0.25	0.20	0.15	0.085	
	Fr												0.13	0.083	0.05	0.034	0.022	0.016	0.011	0.005	
1000	VH													0.88	0.62	0.44	0.31	0.25	0.19	0.10	0.06
	Fr													0.10	0.06	0.041	0.026	0.02	0.013	0.06	0.003
1250	VH													1.50	0.95	0.69	0.46	0.37	0.28	0.16	0.09
	Fr													0.15	0.10	0.06	0.039	0.028	0.02	0.01	0.005
1500	VH														1.40	1.00	0.66	0.53	0.40	0.235	0.13
	Fr														0.13	0.085	0.055	0.038	0.026	0.013	0.006

VH—velocity head in inches of water
Fr—friction in inches of water per 100 feet (for clean steel pipe)

*Correction factors for conditions other than those specified are listed under "NOTES FOR TABLE 3" on the next page.

the United States. In practice, 1½ in. Hg depression relative to 29.9 in. Hg, giving a factor of 0.95, would appear to be sufficient.

Example: 1½ in. Hg barometer depression 0.95
Factor for 2500 ft elevation 0.91

Net theoretical draft – Multiply theoretical draft by weather and altitude influence factors.

Example: $0.57 \times 0.95 \times 0.91 = 0.49$ in. wg per 100 feet. This is also directly available in Table 2 for 5 percent barometer depression, 100 F outside air temperature, and 2500 ft altitude, the value being 0.493 in. wg per 100 feet.

Required Draft

Determine the draft required for the particular equipment based on peak load conditions. Assume that 0.45 in. wg are required.

Breeching friction – The stack friction in Table 3 may be used to determine friction after first converting rectangular breeching dimensions to equivalent diameter. Include entrance loss to breeching, and breeching exit or stack entrance loss. Assume, for example, a value of 0.25 in. wg. To cover unaccounted-for conditions, a tolerance of 15 to 30 percent of the total of required draft and breeching friction is suggested.

Total required draft:

Equipment	0.45
Breeching	0.25
Tolerance	0.20
Total	0.90 in. wg

Height and Diameter

The quantity of gas to be handled now must be determined. Obtain from manufacturer's data the products of combustion at peak load in pounds of gas per hour, and add 15 to 30 percent for leakage, low CO_2 concentration, and tolerance.

	Range	Example
Leakage into a long breeching	5 to 10%	8%
Leakage from each idle connected boiler	5 to 10%	8%
Leakage allowance beyond rated performance	5 to 10%	8%
Total	15 to 30%	say 25%

Example: For a peak gas flow requirement of 100,000 pounds per hour, this 25 percent tolerance gives a value of 125,000 pounds per hour.

Velocity head – This may be assumed at the lowest figure in Table 3. For natural draft, this velocity head factor will be assumed to be between 0.04 and 0.06 in. wg. An exact knowledge of gas velocity itself is of little importance but 0.05 in. wg. velocity head corresponds to 1200 fpm and 1.0 in. wg to 5400 fpm, at 500 F and 29.9 in. Hg barometer,

Diameter – Enter Table 3 at 125,000 pounds per hour and follow horizontally to the lowest VH figure on the right – 0.06; then move upward to read 7.0 ft diameter. This diameter is applicable to the stack outlet where the velocity head is maximum if the stack is tapered.

Friction loss in stack – Below the VH figure of 0.06 in the 7.0 ft diameter column, Table 3, is the Fr or friction coefficient of 0.014 in. wg per 100 ft of stack (clean steel pipe). A tolerance for

NOTES FOR TABLE 3

VH and Fr figures from Table 3 should be multiplied by the following factors for conditions other than those specified. (Do not use factors from Table 1 as they are inversely related:)

Weather Influence

Subnormal in. Hg	Barometer Factor
0.0	1.00
1.5	1.05
3.0	1.10

Gas Temperature Influence

Degrees F	Factor
300	0.8
400	0.9
500	1.0
600	1.1

Altitude Influence

Feet Above Sea Level	Factor
0	1.00
1250	1.05
2500	1.10
5000	1.22
7500	1.33
10000	1.47
12500	1.60
15000	1.75

Concrete or Brick

Friction is greater than listed in Table 3 for steel. Use factors for increasing tabulated friction as follows:
Concrete 1.15 Brick 1.3

Leeway over Fr Factors

The Moody paper notes ±10 percent variation in friction for commercial steel pipe, and the data are for clean conditions. To give an allowance for soated conditions and test variations a factor of 1.15 to 1.25 is suggested.

Combination of Factors

At the outset of each new problem factors for weather, altitude, gas temperature, and leeway should be combined to facilitate use of Table 3. (A similar approach will help in using Table 1.)

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sooted surfaces and unknown variables should be added – resulting in an Fr of, say, 0.02 inches per 100 feet. Add 15 to 20 percent for a concrete stack, 25 to 30 percent for a brick stack.

The stack height now is obtained simply by means of the following formula:

$$\frac{\text{Required Draft} + \text{Velocity Head}}{\text{Theoretical Draft/100 ft} - \text{Stack Friction/100 ft}}$$

Then for the assumed condition:

$$\frac{0.9 + 0.06}{0.49 - 0.02} = 210 \text{ feet effective stack height}$$

An economical stack size commonly is considered as that with a minimum product of height and diameter. Several additional trials may be made quickly with higher velocity head values to determine if there is a lower H × D product.

Gross height – The effective height, 210 feet, applies above stack inlet. If the inlet is 30 feet above grade, this results in a gross height of 240 feet.

Induced Draft

The height for natural draft may be limited by plant location, cost, or other conditions that may make induced draft necessary. Stack diameter calculations for induced draft may be initiated with a higher velocity head that reasonably can be included in the induced draft fan capacity, or that is required specifically to increase the effective stack height for dust dispersion. For example, suppose approximately 0.5 in. wg velocity head meets these conditions. For 125,000 pounds per hour gas flow, Table 3 indicates 0.55 in. wg VH in the 4 ft diameter column, with an Fr value of 0.19 in. wg.

Although the stack height for induced draft is limited, it must be sufficiently high to clear adjacent buildings and equipment. Let us assume a gross height of 80 feet, and an outlet height of 30 feet, yielding an effective stack height of 50 feet.

Induced draft fan suction

The required draft as before	0.90
The velocity head is now	0.55
Subtotal	1.45 in. wg
Additional breeching loss assumption because of ID fan connections	0.25
Tolerance addition assumption for higher draft	0.25
Gross Requirement	1.95 in. wg
The stack contribution to draft is (50 ft ÷ 100 ft) × (0.55 – 0.19)	0.18 in. wg
Therefore, the static suction required from the induced draft fan is	1.77 in. wg

The correction factors of Table 3 permit its use under extreme conditions of temperature, weather (barometer depressions), and altitude. Note that the correction factors for theoretical draft are inverse to those for velocity head and friction. ▲▲

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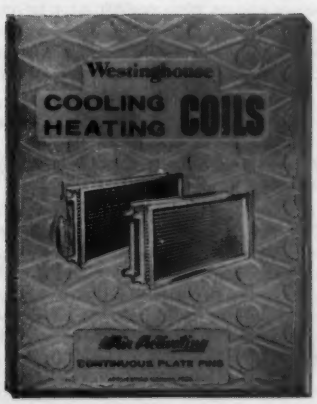

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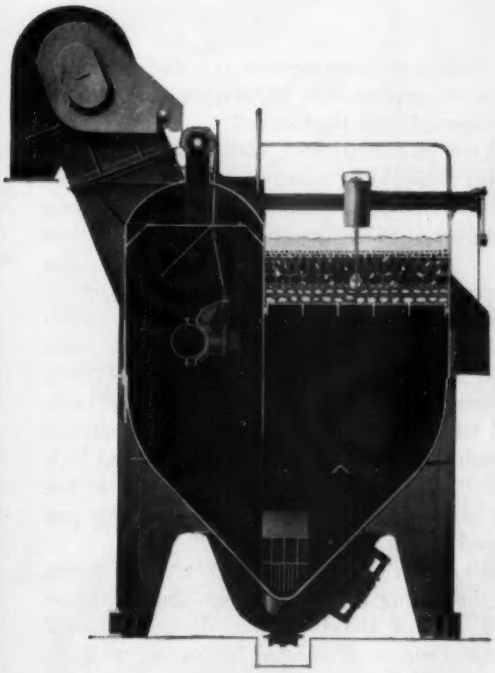

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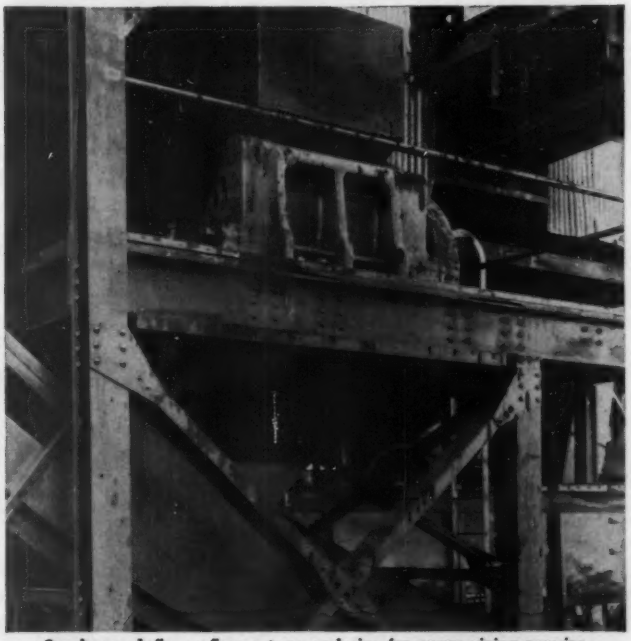

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An Exclusive Report to CONSULTING ENGINEER

By EDWARD J. WOLFF
Immediate Past-President Consulting Engineers Council

ABOUT TWO MONTHS AGO, toward the end of my term as president of Consulting Engineers Council, I received a formal invitation from Mr. Julian S. Tritton, president of FIDIC (The International Federation of Consulting Engineers), asking that the Council send an official observer to the annual meeting of his organization. This meeting was scheduled to convene in Oslo, Norway, on May 29.

Acting rapidly, the executive committee of the Council agreed that I should represent our group at this meeting, and their action was confirmed by the board of directors at our annual meeting.

For several years the Council had been conscious of the existence of the International Federation, but we knew little about its actual functions or its form of organization. Similarly, FIDIC knew something of us, but because the Council is so young, they were not sure that we were representative of U. S. engineers in private practice nor could they be sure that such a young group would succeed in accomplishing its constitutionally stated objectives. But during my term of office I had carried on considerable correspondence with Mr. Tritton and other officers of FIDIC, and we had made sure that these men received copies of our Council *Newsletter* regularly. Since many of FIDIC's officers regularly read CONSULTING ENGINEER, they had an opportunity to learn not only about the Council but about its relations with all the other U. S. engineering societies, technical and professional.

Incidently, in my subsequent meetings with consulting engineers in Europe, I found that many of them had assumed that CONSULTING ENGINEER was the official publication of the Council. They frequently congratulated me on our Council being able to produce such a prosperous, professional publication. I had to explain that there was no connection between the magazine and the Council — that the magazine was an independent business venture while the Council's *Newsletter* was its only periodical publication. I went on to explain that the *Newsletter* did not carry advertising, and that we were inclined to think that it would be unethical for it to do so and still be the Council's official publication. The Editor of CONSULTING ENGINEER, who was in Europe at the same time as I, also was often called on to explain that his magazine was in no way connected with the Council.

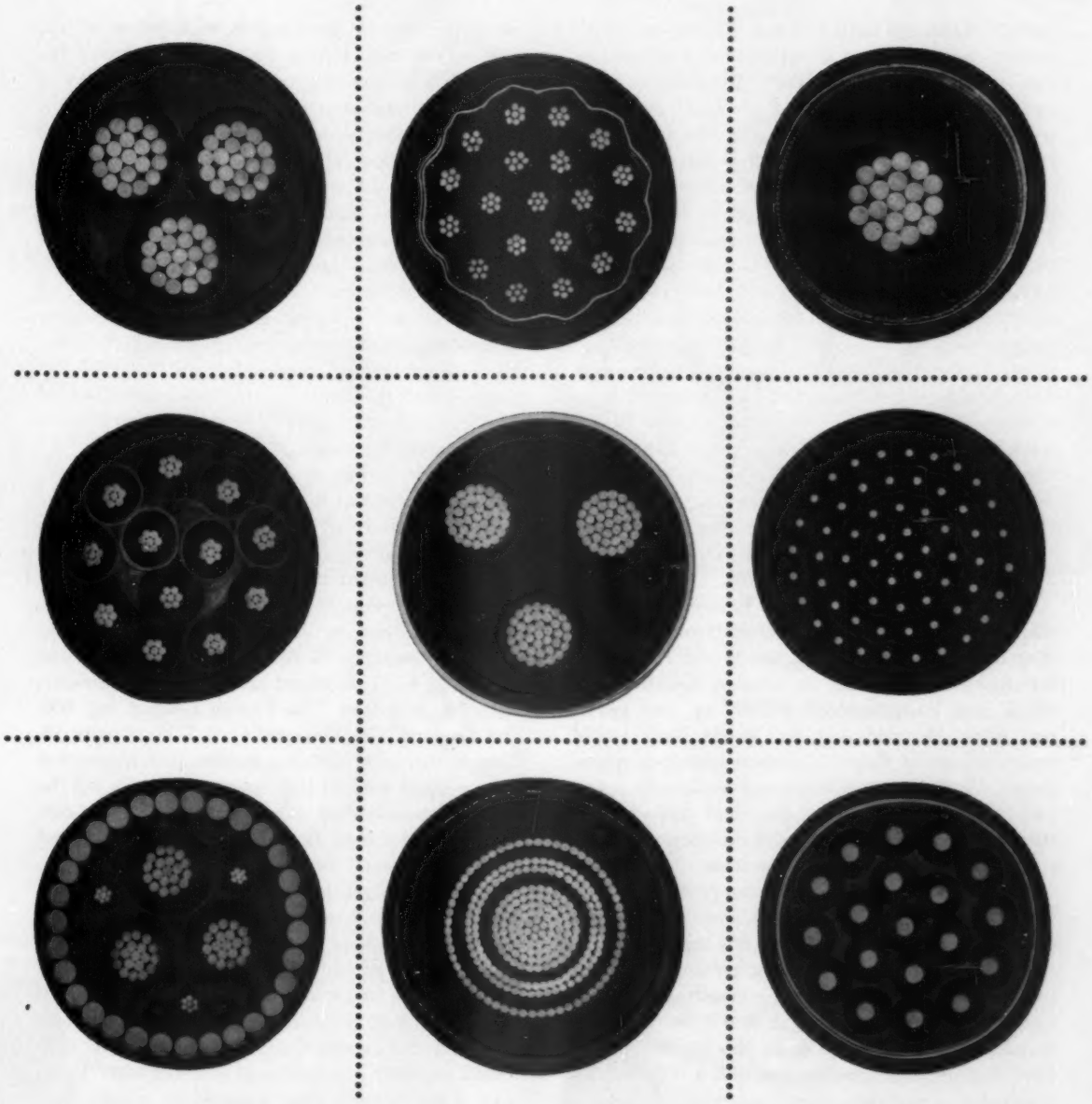
I did not go directly from United States to Oslo. I felt that it would be wise for me to first visit several of the European countries whose associations are members of FIDIC and meet with some of their officers. In this way I could learn about European engineers and their associations before the meeting and would be better prepared to participate intelligently in the Oslo sessions. I went directly from Chicago to London and there met with Mr. Tritton. I got from him a considerable amount of background information on both the British Association of Consulting Engineers and the International Federation. I was able, also, to inform him of the actions of the Council at the annual meeting, just concluded in San Francisco.

From London Mrs. Wolff and I went to Paris, where the timing of our visit coincided with the Paris portion of the 1958 Consulting Engineers' European Tour, as conducted by CONSULTING ENGINEER magazine. We were invited to participate in the activities of this group and attended a luncheon at which the American engineers were hosts to the members of the French Council of Consulting Engineers, and two days later we joined these two groups for dinner on a boat on the Seine. Meanwhile I had the opportunity to talk with the officers of this French Council and their Oslo delegates.

After a short visit to Brussels and the Exposition, we went to The Hague, where I had dinner with Engr. H. Rusting, who is currently secretary of FIDIC, and the next day we went on to Copenhagen, where I was fortunate enough to be able to discuss engineering society matters with Ove Guldberg, secretary of the Danish Association.

As a result of these preliminary visits, I felt that I was meeting with men I knew rather than with strangers when all of the FIDIC delegates and their wives gathered for the "get-acquainted" cocktail party, held in Oslo's Continental Hotel.

The next morning, May 29, the business session of the meeting began at 10:00 a.m. in the Oslo Engineers Club, and except for time out for luncheon,



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continued through until 5:45 p.m. There were 19 directors and alternates in attendance, representing the 10 associations in FIDIC. In addition there were the two official observers, Mr. G. H. H. Legge, from the South African Association of Consulting Engineers, in Johannesburg, and myself.

During the morning session we heard the president's annual report as presented by Mr. Tritton. He pointed out that the most important work of the Federation since the last Annual General Assembly, in Essen, Germany, had been the agreement and signing of the International Conditions of Contract for Works of Civil Engineering Construction. ("Standard Contract Agreement" CONSULTING ENGINEER, Nov. 1957, page 112.) The standard document had been developed by a committee of FIDIC working with a committee of an international contractor association (FIBTP). The report pointed out that these Conditions are now in use by some of the member associations, and the English text has been widely circulated. French, German, and Spanish texts will soon be available.

Mr. Tritton's report went on to say that he had discussed the text of the Conditions with Mr. Eugene Black, President of the World Bank, during Black's recent visit to London and that Mr. Black had complimented FIDIC on the job it had done. He said that the World Bank would make full use of these Conditions wherever appropriate, for they put international tenders on a fair and comparable basis and they laid down clearly the duties and responsibilities of the client, the consulting engineer, and the contractor.

The president's report then further pointed out that FIDIC also has been entrusted with the preparation of International Conditions of Contract for the Supply of Plant and Machinery, covering mechanical and electrical work. A committee is being formed to draft the document. It will be drawn up in much the same manner as the Conditions for Civil Engineering Construction, and it will become a valuable companion piece.

FIDIC is coming to be recognized, according to the report, as the international authority on all matters concerning the status of consulting engineers, and the prospective addition of new representation from the United States and other parts of the world was felt to be an indication that the Federation might look forward confidently to fulfillment of its major task of maintaining and enhancing the status of the profession.

During the afternoon session, I was asked to explain to the group the organization and operation of the Consulting Engineers Council in the United States. I had anticipated this request and had prepared a carefully worded paper covering the subject. At a meeting here in the U. S., it would have been possible to give a full explanation of the Council's activities from brief notes, but this becomes a more exacting undertaking when many of those most interested speak little or no English. I made sure that in my paper I had avoided all idioms or colloquial expressions, and as a result, everyone was able to understand what I had to say.

I was asked a number of questions by the group, and we then listened to a similar explanation of the South African Association as presented by Mr. Legge. Then, he and I left the room for perhaps an hour while the delegates discussed the possibility of inviting our organizations to join the Federation. Upon our return we were informed that both the Council and the South African Association would be welcomed as members and that an official invitation would be issued to us.

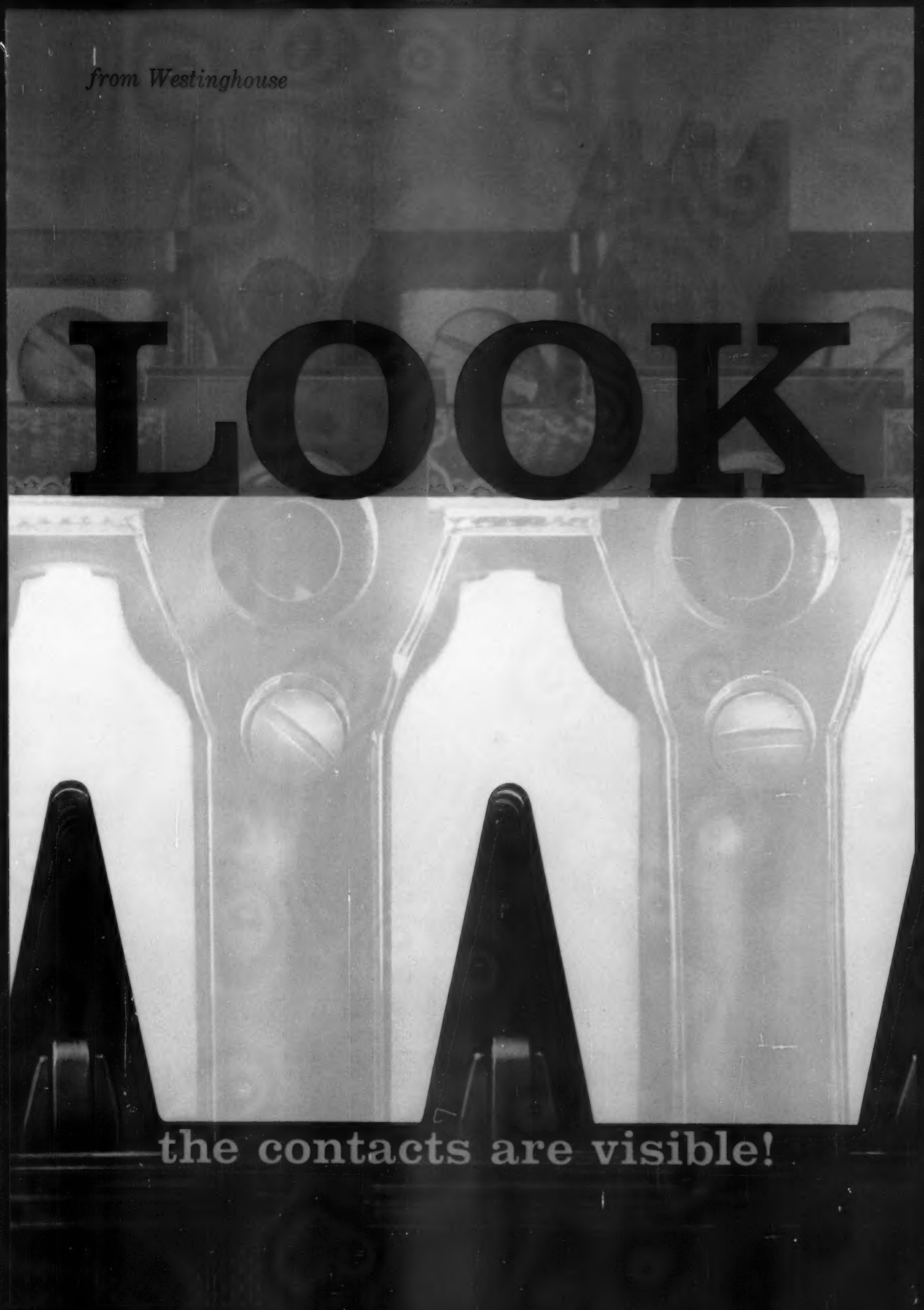
I was not authorized to accept for the Council, but since my return I have provided the Board of Directors with a full report and have strongly recommended that we become members of FIDIC.

In my investigations of the International Federation I found that they now have 10 association members (Belgium, Denmark, Finland, France, England, Germany, Holland, Sweden, Norway, and Switzerland). The largest association is Germany, with 700 members. The French Council has 600, and England 474. The smallest is Finland with 25. Despite this wide variation in size, each association has an equal vote. If the Council joins, we will be the largest individual member association, for currently we have over 1200 members in our affiliated state and regional associations.

FIDIC's budget is small. The dues formula is based on size of membership and is payable in Swiss francs (about 25¢). The formula calls for a base payment of 150 francs plus 2 francs for each member up to 100; 1 franc for all members from 100 to 300; and 0.20 franc for all over 300. This would mean that the current Council membership of 1200 would require a dues payment of about $200. However, if the Council joins, it would be necessary to send delegates to each FIDIC General Assembly.

I feel strongly that the great advantages of international cooperation would make the cost seem small indeed. I know that by active participation in FIDIC committee work we could be of use to the Federation, and I also feel certain that the Council would gain prestige and useful working information. In my opinion we could offer, through FIDIC membership, more to our current member associations and have more to offer to newly formed or planned associations.

I look forward to the next FIDIC General Assembly, at which time I hope the Consulting Engineers Council will participate fully as a member of this world federation of consulting engineers. ▲▲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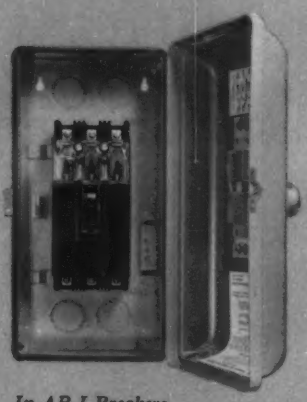

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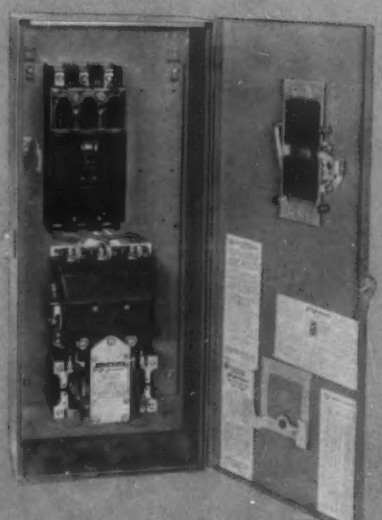

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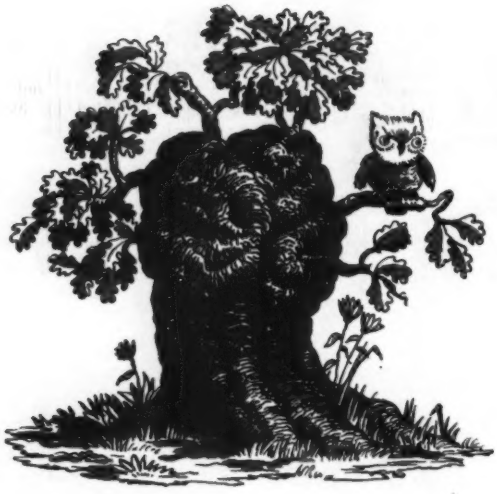

Dealing With the Architect Client

CONSULTING ENGINEER
STAFF REPORT

A REPORT FROM THE COMMITTEE OF ONE-HUNDRED. Why should an architect retain a consulting engineer? Wouldn't he be better off hiring his own employee engineers and get the work done cheaper? Does it actually make any difference to the client who does the engineering—an independent consultant, an employee engineer of the architect, or various manufacturers and suppliers—since the entire design is coordinated by the architect anyway?

Questions like these we asked of the Committee of One-Hundred. Their answers are excellent reasons why architects (and clients) do better to use consultants, instead of costly employee engineers or haphazard "free" engineering.

The Committee of One-Hundred is made up of prominent engineers from all parts of the country. They represent all sizes of firms and fields of specialization. This report is a composite of their thinking. It is not the opinion of any one man on the Committee, but all of them will agree with most of it and most will agree with all.

IT IS THE OPINION of the Committee of One-Hundred that consulting engineers and architects should be able to work together as a team to give the client the best possible design for his money, with the architect being responsible for the building's appearance and spatial layout, and the consultant being responsible for structural, mechanical, and electrical aspects of the project.

CE exclusive

Architect is Prime Contractor

But unfortunately, according to the Committee, this is not always the way projects are handled. While in theory there is a clear division between the responsibilities of the architect and engineer, in practice the line of demarcation blurs and the areas overlap. On most nonindustrial and even some industrial jobs the architect receives the warrant from the owner, becoming in effect the prime contractor, and he engages the engineer. Because the engineer's proposals and designs go through him, the architect often subordinates them to architectural considerations—and the engineer has no recourse.

As prime contractor, the architect receives the basic fee, and then he passes along to the consultants their share. But many architects have a strong urge to get the engineering done for as little cost as possible, retaining as much of the fee as possible. Then, by shopping around for the cheapest engineering, the architect almost guarantees an inferior job. Not only does the owner lose by getting inferior engineering (for the same price), but the architect shortchanges himself on the design, and may have to use his own less-experienced staff to check structural and mechanical drawings.

Some architects try to save even more of the fee for themselves by hiring their own fulltime engineering staffs. This way they avoid altogether the fee for engineering, paying for it instead on a salary basis. This means that engineering will play second

fiddle to architectural considerations, for the architect is almost sure to dominate when his engineer is a dependent employee.

Many of these employee engineers would make the grade only under the supervision of an experienced consultant. They require engineering guidance, but the architect cannot provide this guidance. He is not a competent judge of good engineering, any more than the average consulting engineer is a judge of good architecture.

It is wrong for the architect to expect as much from an employee engineer as he would expect from a consulting firm. He cannot afford to hire an engineer with the ability of a good consultant, for a man with those qualifications would demand of the architect equal pay and stature within the firm. Then, too, the employee engineer is given all types of work – electrical, structural, mechanical – and at times must do drafting and other menial chores. Few engineers can grow and excel in such an environment. The consulting firm, on the other hand, offers men with ability in all these specialties, supervised by experienced engineers.

When the architect is faced with a problem beyond his engineer employee's ken, he often tries to get "free engineering" aid from the suppliers, the manufacturers, and the contractors. The hazards of this "scavenger engineering" are well known to the consultant – but may not be understood by the owner until it is too late.

Idle Hands Eat Up Profits

There is yet another disadvantage for the architect who tries to use employee engineers. He will find that he does not always have enough work to keep them busy. But he must continue to pay salaries, even though the men are idle. Idle time soon eats up whatever savings the architect thinks he has gained by hiring his own engineering staff.

Besides better quality work and actual dollar savings that consultants offer architects, they also can do the job quicker. And the architect who engages consultants will find his office relieved of the need for checking structural and mechanical shop drawings. He is further relieved of personnel problems and keeping payroll and employment records.

The architect who uses the services of competent consulting engineers has the satisfaction of being able to assure his client that he is getting the best engineering talent available, backed by years of experience and training. The architect can be sure of this for he is free to select the consultant best qualified for the particular project.

All architects are not convinced by these arguments in favor of the use of engineers in private practice. For those who doubt, the best argument is the consultant's actual performance on a job. When shown a completed project the architect can see firsthand the quality of work done by the consultant, and he can compare the low cost with what his own expenses would have been for the work.

Do It Yourself

If all of these fail, some members of the Committee suggest that the consultant go get some clients for himself, then look around for an architect to handle the aesthetics. Indeed, many of the Committee feel it would be better if the consultant always had a separate agreement with the client, and all projects were joint ventures. The client would deal equally and directly with the engineer and the architect, instead of with the architect alone. The architect and engineer would be equals, and the client would get a better appreciation of the importance of the engineer as part of the over-all project. (Some of this awareness of the engineer's importance might rub off on the architect, too.) Then the client would get a coordinated engineering design instead of unrelated gobs of engineering brought together under the supervision of the architect. In addition to enhanced prestige and recognition, the consultant would benefit financially. These joint ventures are not uncommon today and are growing in number.

Many architects prefer this type of arrangement where engineering represents a major part of the project. One reason for liking the joint venture is purely financial. All too often architects acting as prime design contractors establish their fees too low. By the time they have paid for the engineering, there is not enough left to cover the architect's own work. This situation is exaggerated when the architect works on the premise that what he loses on the little commissions will be made up on the big ones. This does not pay off. Every job must pay its own way. Starting with a too-low fee means the architect has to haggle over the price he pays for engineering, or he loses money himself. All this is avoided on the joint venture, with the architect being paid for his work and the engineer being paid directly by the client for his.

Many architects simply fail to realize the work the consultant does, and the time, effort, and ability required. The consultant constantly is faced with more and more intricate designs, more detailing, more checking, more supervision. If he is going to continue to operate an independent profit-making firm, fee adjustments will have to be made for work done for architects.

Where Did the Fees Get Started?

The present-day engineering fee arrangements seem to have been based on engineering at the turn of the century when mechanical, electrical, and structural engineering was much less complex than it is

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now. Many "architectural" aspects of a project are actually engineering work today. Because the amount of engineering required has increased so drastically, without any corresponding increase in the fee, consultants serving architects too often are forced to do a quick, routine job to keep costs down. They could do better – but not under current fee schedules.

A Fair Fee Split

The members of the Committee feel that a fair division of the total fee would be 20 to 25 percent to the architects (for a finder fee, negotiation, dealing with the client, blueprints, and coordination) and 75-80 percent to the consultants. A standard fee division, perhaps spelled out in the architect's contract with the client, would allow the architect to select the consultant by merit instead of price.

Any rearrangement of the fee division requires mutual understanding and trust between the architect and engineer. Presumably the architects will be loath to cut their own share, but they must recognize that through the years the percentage of a project that is engineering in nature has gone up while fee division has remained unchanged. If there can be no adjustment of the fee, it may be necessary for the consultant to deal directly with the client. Meanwhile, engineers should refuse to work for architects for fees that are too low to permit competent engineering.

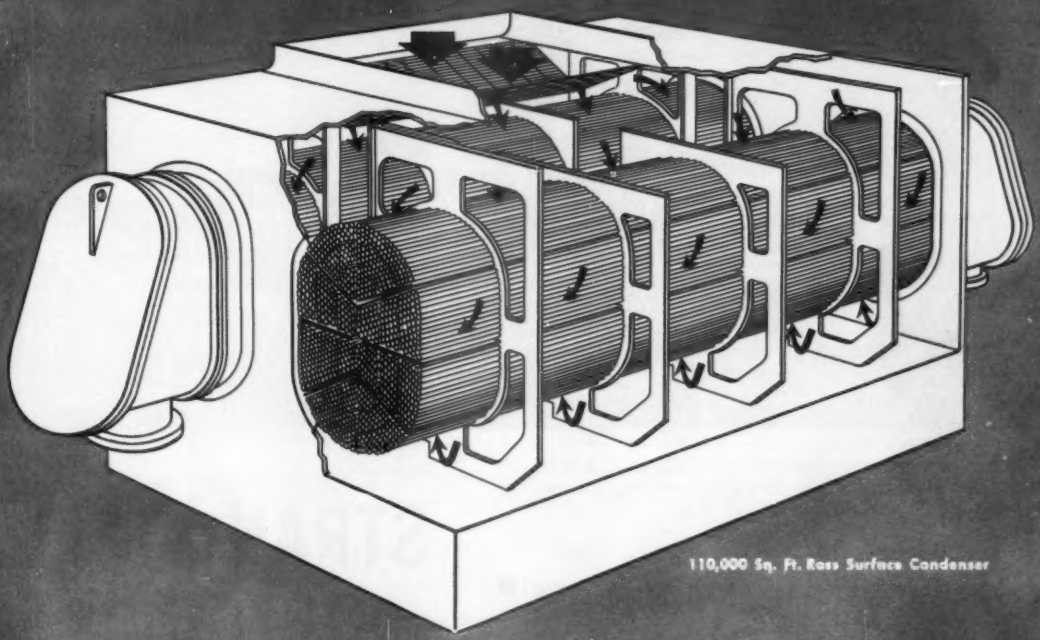
One Solution — Architect-Engineer Firms

There is a trend in the profession that may well offer a solution for some. This is the increasing popularity and growth of the architect-engineer or engineer-architect firm. Here neither architect nor engineer is dominant, but each has equal partnership responsibility. In this type of firm the engineer finds status in accord with his responsibilities. His work (and he himself) is brought directly to the client's attention instead of being hidden behind some architect's skirts. Both the client and architect benefit too because there is no shopping around for the best price on engineering, and no "free engineering" with its consequent hazards. The client gets what he pays for.

The joint firm will never replace entirely the strictly architect-independent engineer relationship, but it is certainly a great improvement over the architectural firm with employee engineers or the engineering firm with employee architects. It puts the two professions on the equal footing they deserve. It shares the fees properly.

The only way this trend can be slowed is by a more general adoption of joint ventures or by a more realistic division of fees between architects and the engineer firms they engage. ▲▲

extremely low bundle entrance velocity



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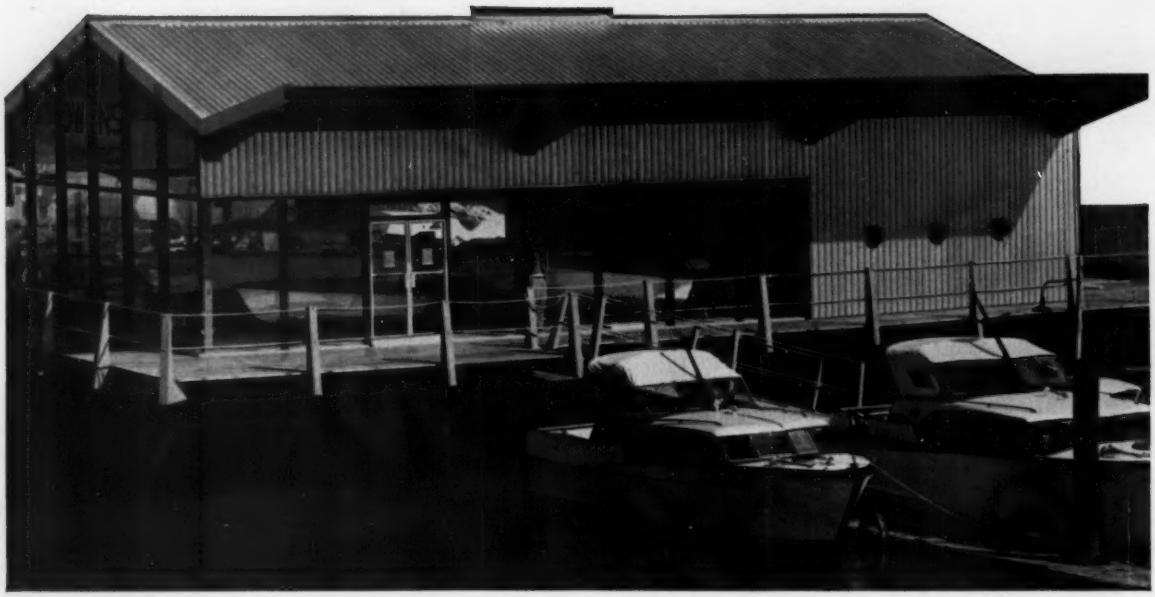

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JULY 1958

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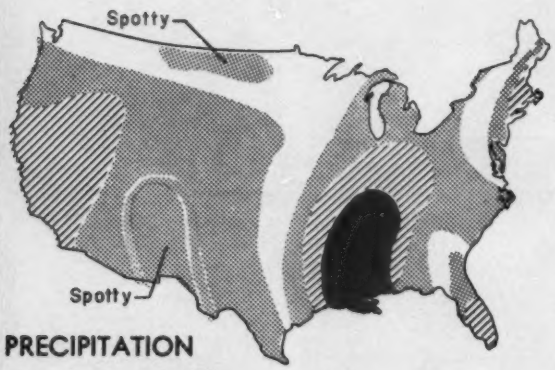

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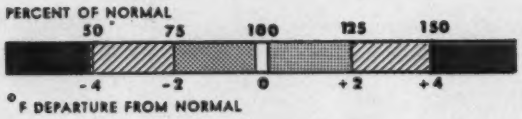
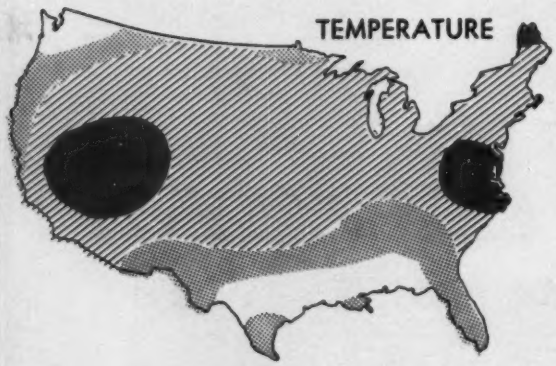




CONSTRUCTION DAY FORECAST LOCATIONS

CONSTRUCTION DAY CRITERIA

To be considered a construction day on these charts, the day's maximum temperature must be more than 38 degrees. There must be less than six inches of snow on the ground. There must be less than six hours of active precipitation between the hours of 7 a.m. and 5 p.m. There can be no more than one inch of rain on the preceding day.

JULY HIGHLIGHTS

A warm month of July is in store for most of the United States, with temperatures ranging from two to four or more degrees above normal over the vast majority of the country. Only the northern edges of the Gulf of Mexico and the extreme Pacific Northwest can expect temperatures to average near the seasonal normal. Hottest spots will be the central Atlantic states and the Great Basin, but temperatures throughout the mid-section of the country will be well above normal. A minimum of bad weather is in store for the far west, where there will be virtually no work interruption because of weather. California, for instance, can expect only about 50 percent of their normally scanty rainfall – and storminess will be only a memory during the month. However, it's another story in the East and in the southern Mississippi Valley. Except for the central Atlantic coastal regions and Florida, above normal precipitation generally will be the rule east of the Great Plains, with moisture in the Mississippi Valley's southern reaches expected to climb well above normal – more than 50 percent above normal in some areas. The frequent and heavy storminess will hold construction days in those areas to a minimum for this normally-good month. Among the eastern states, Florida, the central Atlantic coastal areas, and New England will be drier than normal, with only 50-75 percent of normal rainfall and infrequent important storminess.

TEAR OUT ALONG PERFORATION.

These forecasts are prepared by Irving P. Krick Associates, Inc., the world's oldest and largest weather engineering firm. The forecasts are based on methods developed by this group at California Institute of Technology prior to World War II. After the War, the methods were adapted to high speed electronic computing machines to shorten the time required to solve the complex problems of the atmosphere. Ultra-long range forecasts, up to a year or more in advance, are now available. Information on other Krick weather services is available by writing to the home office of the firm at 460 South Broadway, Denver, Colorado.

CONSTRUCTION DAYS

JULY 1958 ESTIMATES															
LOCATIONS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HIGHEST	31	31	31	31	31	31	31	31	31	31	31	30	31	29	30
LOWEST	30	29	31	30	29	27	29	28	23	28	26	26	21	24	26
AVERAGE	30	31	31	30	31	29	30	30	28	30	29	28	28	28	29
ESTIMATE	31	31	31	31	30	29	31	29	25	28	28	27	29	27	28

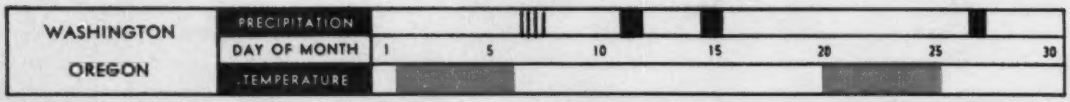
These estimated construction days for key cities in the United States should be interpreted as an average of estimated conditions over the forecast area. To obtain the best results, the forecast number of construction days should be compared with the temperature and precipitation anomaly maps and the timing estimates to determine the probable number of construction days in your locality. The forecast construction days are based on average construction day requirements as defined under "Construction Day Criteria," and should be adjusted for individual operations.

AUGUST AVERAGE AND RANGE*															
LOCATIONS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HIGHEST	31	31	31	31	31	31	31	31	31	31	30	31	30	31	31
LOWEST	27	29	29	28	30	27	27	26	24	26	26	27	26	25	23
AVERAGE	30	31	31	30	31	30	30	29	28	30	29	30	29	28	27

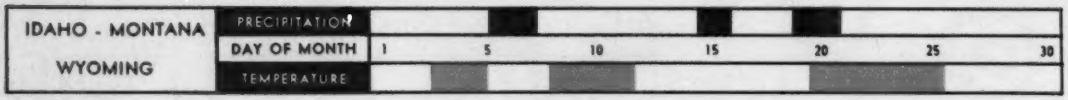
SEPTEMBER AVERAGE AND RANGE*															
LOCATIONS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HIGHEST	30	30	30	30	30	30	30	30	30	30	30	30	30	29	30
LOWEST	26	30	28	28	28	25	25	25	24	26	28	25	24	24	28
AVERAGE	27	30	30	29	30	29	28	29	28	29	29	28	26	27	29

*Historical Average, Not a Forecast

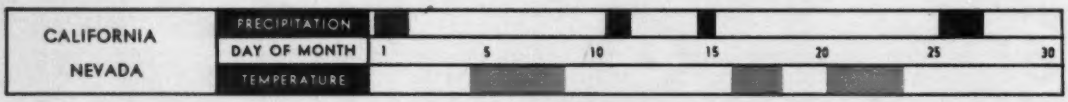
JULY, 1958 TIMING OF S



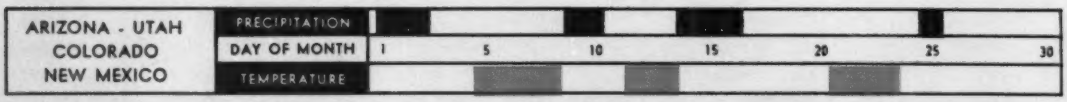
Precipitation will be usually light—mostly scattered showers. Period following 5th applies mostly east of Cascades. Maximum temperatures will rise to 100's inland and to 80's along coast.



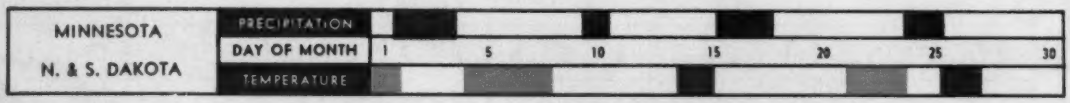
Best shower period will follow the 5th; period around 20th is mostly scattered showers. Warm period maximum temperatures will be near the 100 degree mark.



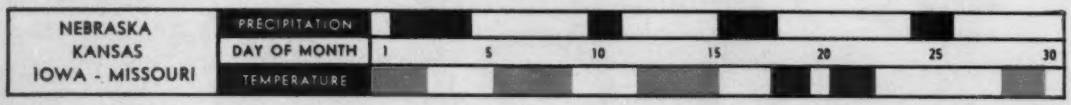
Showers around 1st and 11th are only important in Nevada. Storm period around 15th will bring only clouds to southern California. No important precipitation in California all month.



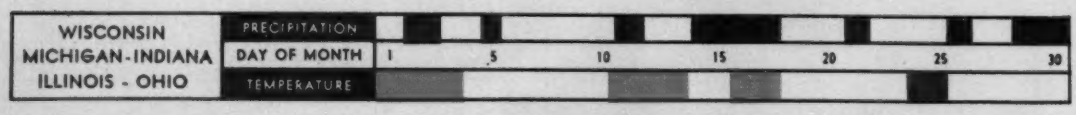
Precipitation is not a factor in Arizona, and showers will be widely scattered and relatively unimportant elsewhere. Temperatures frequently will rise above 100 degrees.



Showers following 15th and prior to 25th will occur mostly in South Dakota and southern Minnesota. Cool periods mostly will feature low daytime maxima.



In addition to above timing, frequent showers are expected between 12th and 15th in Nebraska and Iowa. Temperatures frequently will rise into 100's during heat spells.



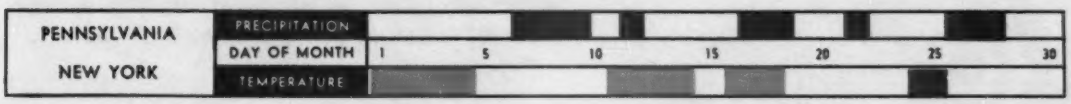
Storminess will be frequent but quite brief, and precipitation will be spotty. Temperature maxima are mostly in mid-90's through the warm periods indicated.

F SIGNIFICANT WEATHER EVENTS

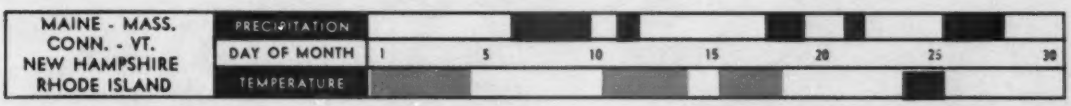
RAIN
SNOW
WARM
COLD

The timing bars below are intended to indicate periods of important general storminess and important departure from temperature normals in areas indicated. They are highly accurate over the area indicated, but are too general to pinpoint small local storminess or showers. Allow one day on either side of indicated storm or extreme temperature periods for general planning. Combination rain or snow shading indicates either one or both.

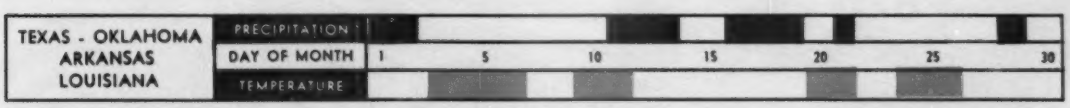
Storminess around 15th will be mostly scattered showers. Highest temperatures during indicated warm periods will be in upper 90's. Cool period is featured by lower maxima.



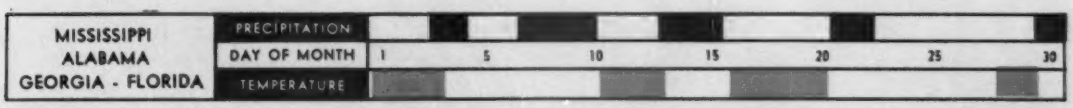
One day storminess is of scattered shower type; other periods are most important rains. Maximum temperatures during warm periods will be in upper 90's in south and in upper 80's in north.



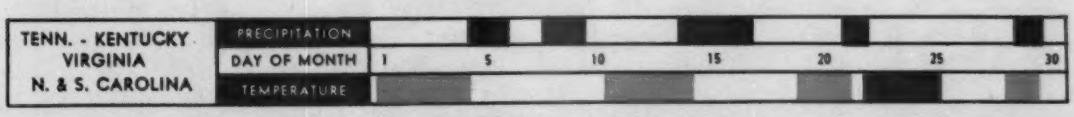
Precipitation around 12th and 22nd is mostly showers; other periods indicate fairly general rains. Maximum temperatures during warm periods will be in low 90's.



Showers around 12th mostly in north Texas and Oklahoma. Most precipitation from spotty showers; little general rains. Maximum temperatures in warm periods will be above 100 degrees.



This area will have an extremely wet month; all precipitation being fairly general rains. Possible tropical storm is indicated for southeast around 29th-31st with strong winds, heavy rain.



Precipitation around mid-month is mostly in the form of scattered showers; most important rains will occur during first half of month. Warm period maximum temperatures will be in 90's.

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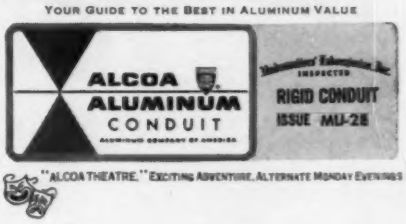
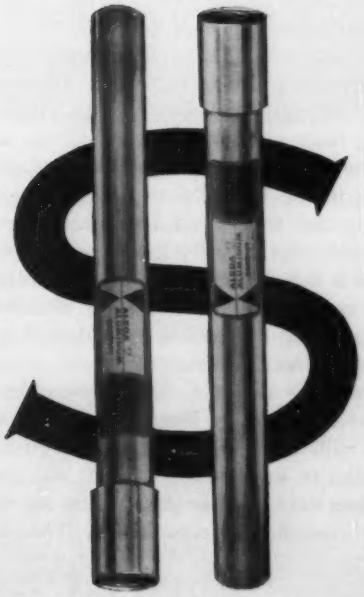




Canadian Consultants Complain of U.S. Competition

STAFF

COMPLAINTS FLEW thick and fast at the second phase of the annual meeting in Quebec of the 26 year old Association of Consulting Engineers of Canada. Target was consultants from the U.S.—very much in evidence in Canada these days.

Opinions Vary

Seriousness of this problem varied according to who was talking. Some thought the Association should crack down on the inpouring U.S. engineers. Others recommended a little soul-searching before anything too drastic was done. Still others – more vocal after than during the meeting – called the whole thing a case of "sour grapes."

"We do not think it is fair to us to grant Canadian projects directly to foreign firms. However, we have no objection to calling in specialists on a consulting basis when the need arises," one said.

"Yet there are no more rules against Canadians practicing in the United States than there are in Canada against consultants from the States," another rejoined. But most felt getting a project in the States was a rare thing for a Canadian consultant, although not impossible, since one member currently is working on a U. S. project with a U. S. consulting engineer.

Another worry of the Canadians was the influx of plans over the border. Rumors say that drawings for a $10-million oil refinery plant entered Canada on microfilm in someone's pocket.

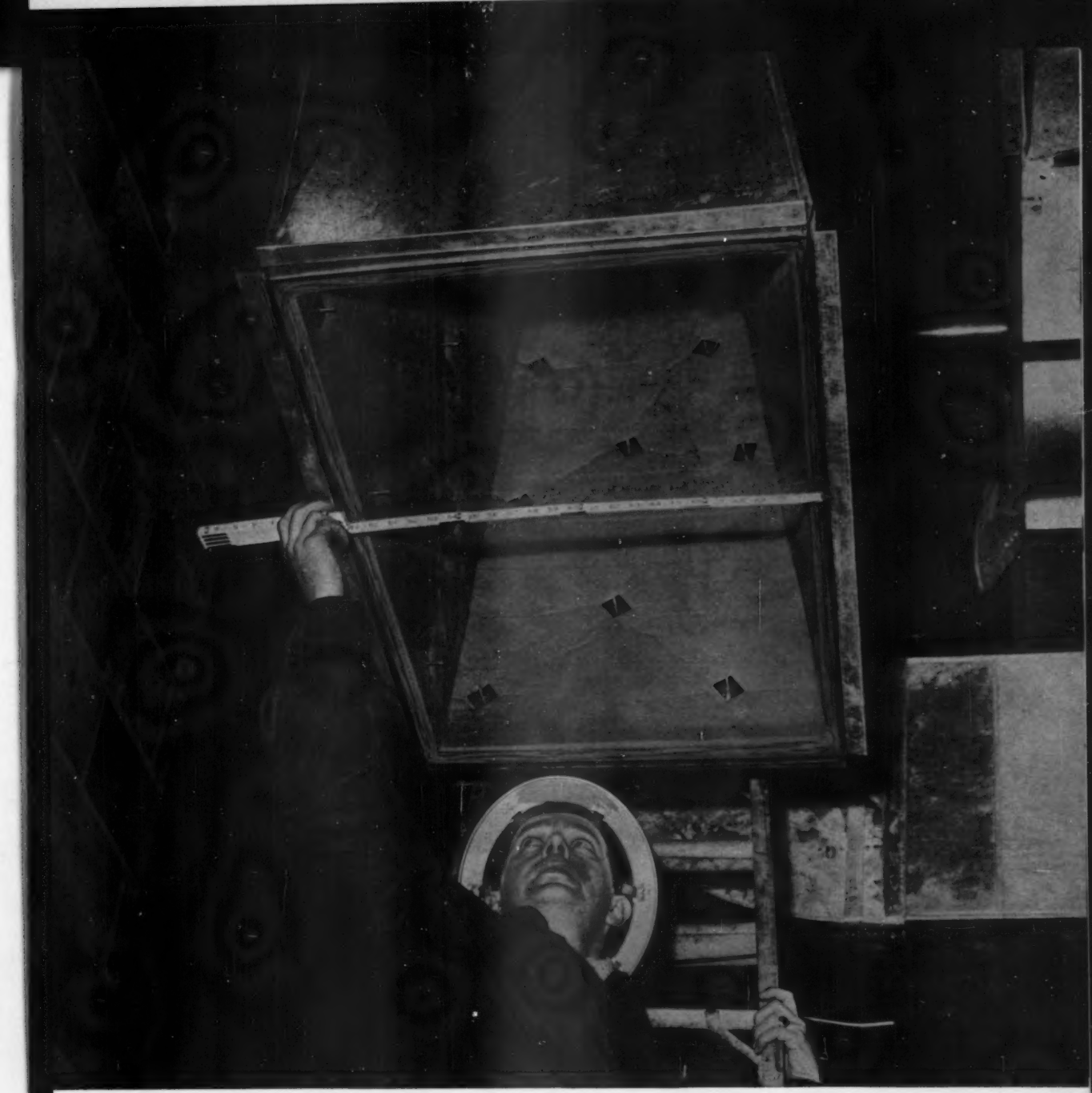
What does the Canadian government say to these Canadian consultants' complaints? The answer should be familiar to all U.S. consultants who have discussed competitive bidding and other problems with the Federal government – "Bring us definite proof." And besides, as someone pointed out, Canadian law prescribes a heavy duty on blueprints, but fails to mention film reproductions.

U.S. Consultants Popular

Asked why United States consulting engineers can get Canadian projects so easily, John G. Frost, Association president, pointed out it is not necessarily superior talent or lobbying. "United States firms, investing large amounts in Canada each year, naturally go to consulting engineers they know and have worked with before. Besides, some Canadians have the idea that Canadian consulting engineers are not competent to handle an extensive project."

U. S. engineers coming to Canada to work have no special immigration procedures to hurdle. As in other professions, engineers must show that they are able to support themselves, are in good health, and are of good moral character. Usually these engineers have a definite offer of employment from some Canadian firm, which must prove it was unable to fill the position with a Canadian.

Several Association members said Canadian consulting engineers are responsible for some of their own problems. Wanting the prestige of a contract, engineers sometimes accept projects when they have neither the staff nor the experience to handle the job. Then they go to a U. S. consulting firm—usually losing control of the project in the process—



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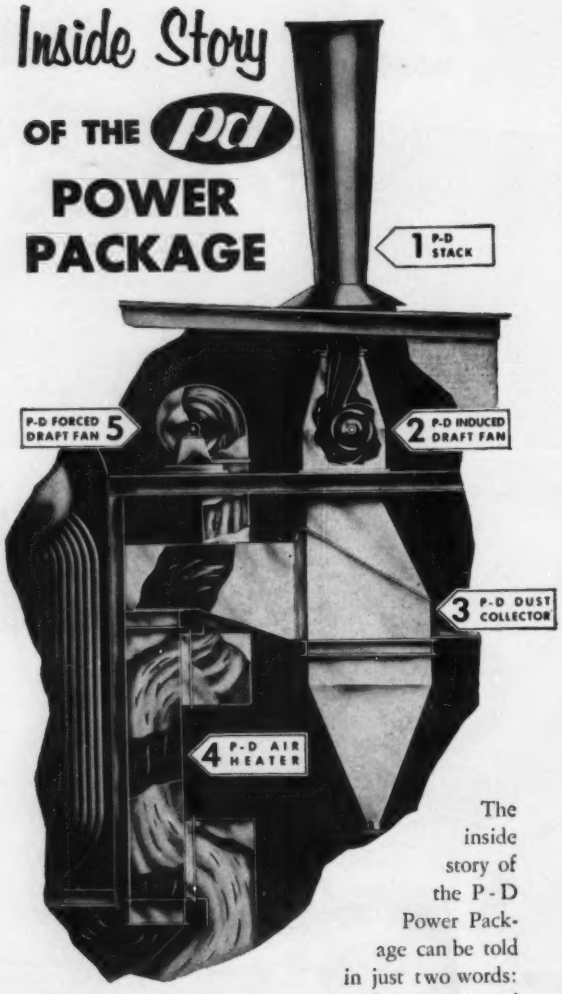

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or they accept "free engineering" from equipment manufacturers.

"We have to make a living, but we should remember we have to do so by a code of ethics," one engineer, who often cooperates with a U. S. firm, pointed out. He said in some cases consulting engineers from the States have had less than professional treatment. He mentioned one instance where the immigration department was given wrong information about a U. S. firm, and the firm was subjected to other "extreme difficulties."

Domestic Problems

Canadian consultants have troubles on the home front, too. A headline calling engineers and architects "top money earners" was mentioned as no help to the public relations of the Canadian consultant. It was pointed out that an income tax classification listing engineers in private practice apart from "consulting engineer salesmen of equipment" would remove Canadian consultants from the "average of $14,000 a year" salary lists bannered in the local newspaper headlines.

Canadian engineers have other purely Canadian problems including "consulting engineers" who sell materials and equipment. "Drafting services" also cause trouble in Canada. These service firms make drawings, and do much of the design work, for any project. But with inadequate supervision, the drafting firms sometimes overlook important details.

"We need to clean up our profession, and stop the use of free engineering and drafting services," Association members said.

During the business session, Frost announced that the requirement for Association membership will remain at five years in private practice, an indication that the firm is well established. Results of a recent balloting mean the board will be increased from six to eight persons, after the Secretary of State receives notification of the charter revision.

R. A. Frigon, chief of the engineering and equipment division, commodities branch, Canadian Department of Trade and Commerce, announced his department will help Association members obtain foreign projects.

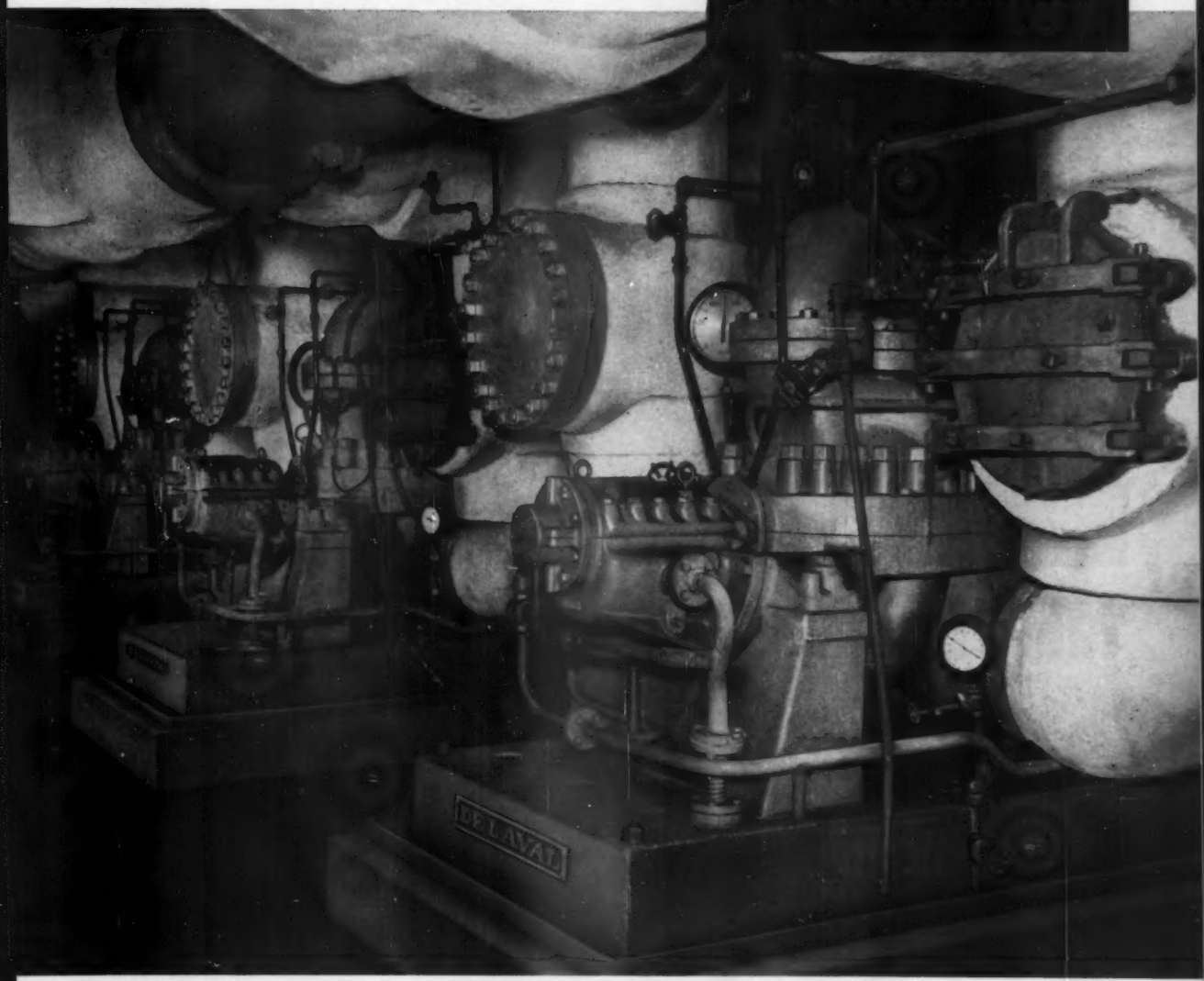
Frigon pointed out that the best opportunities are in the world's underdeveloped countries. After a consulting engineer has become established, the department often can assist him in obtaining projects along the lines of his specialty. However, Frigon said, the initial steps of getting into foreign work are up to the individual consultant.

Frigon announced two trade fairs will be held in the British West Indies during 1959. Frost said the Association board will take the matter into consideration, for participation in an institutional display "might not be a bad idea." ▲▲

Con Edison *reorders*

DE LAVAL

BOILER FEED PUMPS



The three De Laval Oppeller Pumps, shown in the photograph, do a dependable job of handling boiler feedwater at the East River Station of the Consolidated Edison Co. of New York. These three-stage pumps, with double-suction in the first stage, have a capacity of 2,000 gpm and operate at a discharge pressure of 620 psig. As proof of their reliable performance, Con Edison has ordered two identical units for the expansion of this station *plus* similar pumps for their Indian Point nuclear generating station.

Excellent for *medium* pressure and temperature service, De Laval Oppeller Pumps are designed with opposed impellers that balance axial thrust. Standard design features include sleeve bearings and labyrinth wearing rings which assure long economical service.

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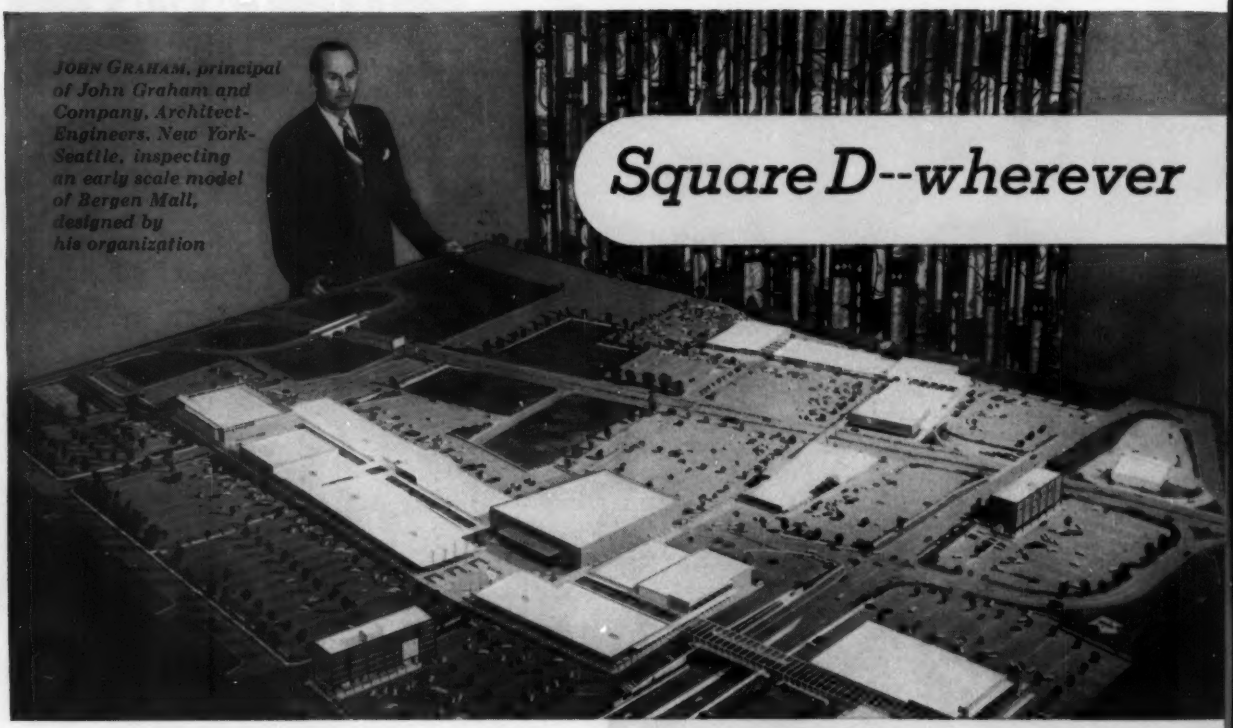
JOHN GRAHAM, principal of John Graham and Company, Architect-Engineers, New York-Seattle, inspecting an early scale model of Bergen Mall, designed by his organization

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106 acres! 1,000,000 square feet of retail selling space already built! 1,500,000 square feet of retail selling space with 100 stores, when completed! 8,500 parking spaces! Such is the Bergen Mall regional shopping center in Paramus, New Jersey, built by Allied Stores Corporation. Certainly Allied, who built the world's first regional center in Seattle, Washington, has done itself proud in this tremendous project, rightly called "New Jersey's finest."

Square D electrical control and distribution equipment is "on duty" throughout this big and architecturally beautiful shopping center.

FIELD ENGINEERING SERVICE is available through more than one hundred Square D offices, backed by an international network of over 1000 authorized electrical distributors and 17 plants in the United States, Canada, Mexico and Great Britain.

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(*Above*) Only one main street ...a proven way to generate heavy shopping traffic. The central Mall, 920 feet long, is designed to create a park-like atmosphere.

(*At right*) The new Stern's department store is a thing of functional beauty. 320,000 square feet on four levels—a total of more than seven acres of space. Exterior combines use of marble, red brick, rough-cut stone and large glass areas.

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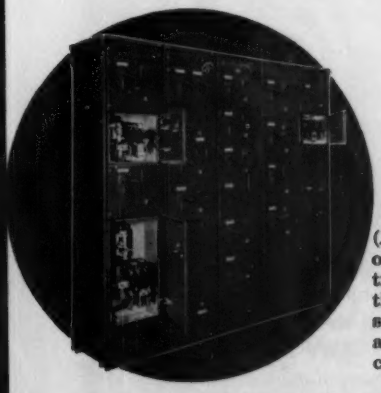
There are hundreds of **Square D Lighting and Power Panelboards** throughout Bergen Mall. These are in kitchen area, and control lighting for the Stern dining room and power for kitchen equipment.

(*At right*) **Square D Feed-In Duct** runs the full length of this half-mile truck concourse, distributing power to the stores on both sides.



(*At left*) A **Square D Control Center** of this type provides complete control for the air-conditioning system in the Stern store. In addition, there are seven **Square D Switchboard** installations with a total combined ampere capacity of 22,500 amperes.

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Report From Africa

PETER HOLZ
Consulting Engineer Correspondent

BOOMING INDUSTRIAL EXPANSION in the Union of South Africa shows no sign of abating, in spite of the world-wide recession. Much foreign capital, particularly from America and Britain, has underwritten the continued business activity. And this prosperity is reflected in a high level of projects for bona fide mechanical, civil, electrical, and structural engineering consultants. ("Bona fide" refers to true consultants, for in South Africa anyone who can drive a nail into a wall may call himself an engineer, or even a consulting engineer. There is no law against this at the moment, but professional engineers constantly are agitating for corrective legislation.)

CE exclusive

Fee Arrangements

Generally South African consultant's fees are based on a sliding scale, commencing at about 10 percent of the total cost on a $7500 job down to 5 percent on a $3-million job. On special projects the fee is set by negotiation between consultant and client.

When the prime contractor is an architect the fee is determined by the consultant, the architect, and the client, in line with a scale of professional fees set up by the Institute of South African Architects and the Chapter of South African Quality Surveyors. According to these groups, "The architect's fee shall in no case be reduced by more than 1 percent when a consultant other than an architectural consultant is engaged, provided always that the architect's fee on the cost of the whole scheme shall not be reduced by more than ½ percent."

South African consulting engineers, particularly those belonging to the select South African Association of Consulting Engineers, (which, like the U.S. Consulting Engineers Council, has just been invited to join the International Federation of Consulting Engineers) have a very strict code of ethics and may not advertise at all. The only time their names appear in print is on their office doors and on tenders placed with contractors on behalf of government departments, various municipalities, or private firms.

As in the U. S., municipalities and government agencies in the Union of South Africa do not employ consultants on a permanent basis, but engage them for individual projects. Consultants usually are located in the Union's bigger cities – Johannesburg, Pretoria, Durban, Port Elizabeth, Capetown, East London, and Bloemfontein.

Many consultants have offices in more than one city; a number of such offices are branches of large British consulting engineering firms. These branches are staffed predominantly with South Africans. One such firm, Messrs. Arup, Ove and Partners, consulting structural engineers with parent offices in London, has branches in Johannesburg; Lagos, Nigeria; Accra, Ghana; Nairobi, British East Africa; and the cities of Salisbury and Lusaka, located in the Central African Federation.

Surprisingly, no U. S. consulting firm has offices in South Africa, although many U. S. engineers handle projects in the country. For example, Dr. J. L. Savage, Denver consultant, is working with Mr. Ninham Shand, a Capetown consulting engineer, on the $15-million Wemmershock dam.

Labor Shortage

Africa has an acute shortage of skilled labor, particularly in the industrialized Union of South Africa, where 60 percent of the "Europeans" in Africa are concentrated. Consultants who award contracts to individual firms, by tender or otherwise, are directly concerned with this shortage. For example, a consultant might award a contract to a certain contractor, who must complete the work by a certain date in spite of the labor shortage. As all engineers, draftsmen, technicians, and tradesmen in South Africa are "Europeans" (even if they are Americans or Australians), the contractor must, of necessity, get his skilled labor from this comparatively small force. Being in short supply, these men are extremely independent and will leave a job to

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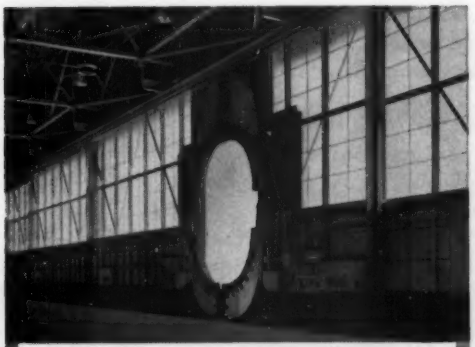

The Byrnaperture consists of a series of movable segments, operated either by hand or electric power, which fit snugly around fuselages from the Convair to the DC-8, Boeing 707, and other large commercial jet planes of the future.

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take on another at a moment's notice. Since World War II there has been keen competition among contractors for good men, and the local press always is filled with advertisements for them.

The relationship between consultants and contractors, and consultants and architects, is generally of the best, and the consultants help contractors as much as possible to overcome labor problems by "channeling" suitable men to the contractor whenever they can.

Water Works

While the area is not as dry as the Sahara in north Africa, water always has been a bottleneck to industry in South Africa. There are few major rivers in the industrial areas; many of the minor ones dry out completely for part of the year. In fact, if you fall in a river in South Africa, all you do is shake off the dust and climb out again.

Never have South Africa consultants been busier with water-preservation and irrigation schemes, dam-building and hydroelectric projects. For example, one of the largest consulting firms in the country—Stewart, Sviridov and Oliver—is engaged on a 250,000-gallon water tower, a reinforced concrete reservoir, and pumphouse buildings.

Just completed outside Capetown is the aforementioned Wemmershoek Dam. The main wall of this embankment dam, which forms a span between two mountain slopes, is constructed almost entirely of materials available within a few miles of the dam site—earth, clay, and stones.

Embankment construction was chosen because it is cheaper than concrete construction and because it was not certain that the site would support a concrete dam. This dam means the people of Capetown and the smaller towns in the vicinity no longer will be threatened with water shortages during torrid summer months.

Tenders were invited in 1952 for the construction of this dam under a target-estimate type contract. Such tenders, which consultants draw up, are placed with the most suitable tenderer. The latter may obtain a copy from the consultant after paying a small deposit of about $10 or $15. He has to complete the tender by a certain date and submit it for consideration. The consultant and his client reserve the right to accept tenders for the whole or part of the work, and need not accept the lowest, or any, tender. All tenders can be rejected and the entire project called off.

Power Projects

Hydroelectric projects also are booming. Of all the continents, Africa has the greatest potential of hydroelectric power. The world's hydroelectric resources are estimated at 500-million kw; 200 million

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The B&G Booster used to re-circulate domestic hot water is a bronze unit—immune to the corrosive effects of continuously circulated raw water. To heat the anti-freeze solution for the snow melting panels under the sidewalks and garage ramp and for supplying hot water to the first floor heating system, two B&G "SU" steam convertors are installed.

Inland Steel Building, Chicago, Illinois

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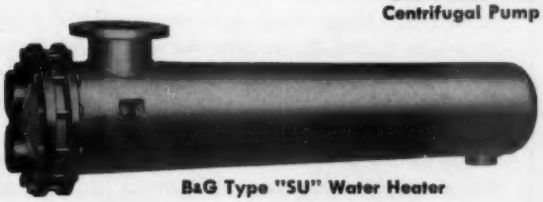
General Contractor:
Turner Construction Company, Chicago.

Mechanical Contractor: Economy Plumbing & Heating Company, Chicago.

B&G Series 1531 Centrifugal Pump



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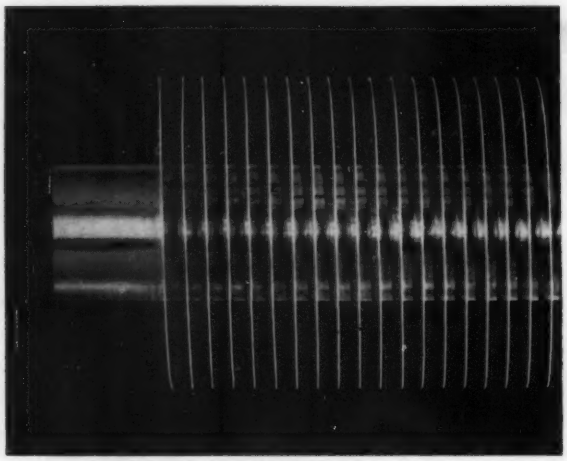

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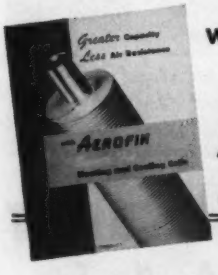

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of this is found in Africa. Whereas four-fifths the European and half the North American resources already are exploited, only a very small fraction of Africa's potential has been touched. Apart from the gigantic Kariba project under construction in the Central African Federation and proposed schemes in Ghana and the Belgian Congo, it is in the French African territories that much hydroelectric power is being developed for industries and communities.

The French have three major projects under consideration: extension of Edea dam on the Sanaga River in the Cameroons to boost power output to 1.3-billion kwh; a large power plant at Konkoure in Guinea with 400,000-kva capacity and a production of 3-billion kwh; and another plant at Kouilou with a capacity of 1-million kva and 7-billion kwh.

The Kariba hydroelectric project on the Zambesi River will be the largest power station in Africa — and, in terms of energy generated, one of the largest in the world. It will supply electricity to the industries of Central Africa; first (in 1960) to the Northern Rhodesian copperbelt, and later to the Federation of Rhodesia and Nyasaland. The system will link Kariba (initial capacity 500 mw and ultimate capacity 1200 mw) with existing thermal stations in the Central African Federation.

Progress . . . With Problems

Electric power also has begun to flow along 250 miles of new transmission lines linking Owen Falls hydroelectric project in Uganda with Nairobi in Kenya, British East Africa. By buying power from Uganda, Kenya has not only staved off a local electricity famine, but also has helped solve Uganda's acute financial problem: plenty of electric power but not enough domestic demand to pay off the project cost. The plant harnesses the Nile as it pours out of Lake Victoria on its 4000-mile run to the sea.

But while the $10-million program is timely and needed, this latest example of interterritorial cooperation in British Africa has run up against strong criticism and misgivings. European settlers wonder what would happen if an independent native-ruled Uganda decided to cut off the power supply.

The Kenya government is therefore encouraging the country's own power concern to prospect for new sources within the colony. The Kenya company already has its eye on the colony's biggest river, the Tana, and at Seven Forks it has plans for a $36-million project to generate 100,000 kw.

Projects such as these have other particular difficulties. In Brazzaville, for example, 2000 consumers of electricity are spread out over an area roughly that of Paris, where there are over 1-million consumers. The high cost of high-tension cable and inevitable transmission losses make it hard to service sparsely populated areas. ▲▲

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Beyond Our Borders

Subterranean Gas Storage

French engineers have begun pumping gas underground. A huge natural reservoir near Paris holds the same volume as 700 gasometers, each with a capacity of 8-million cubic feet. And the reservoir does it for 1/200th the cost per cubic foot of the 700 gasometers that would be required.

Need for the additional storage space is dictated by a steadily increasing consumption of gas in Paris. Current estimates indicate peak Paris consumption during the winter of 1961 at a temperature of 15 degrees above zero Fahrenheit will be 350-million cubic feet a day, well over planned daily production. Without the reservoir, it would be necessary to build new installations or enlarge existing storage units.

Coal-distillation furnaces operate with a certain continuity, and can be accelerated or retarded only slightly. The quantity of gas produced every day is therefore fairly constant. But requirements vary according to season. In a recent year, for example, Paris gas consumption reached 12-billion cubic feet in January, dropped off progressively to 7 billion in August, and rose again to 11 billion in De- increase of a more or less permanent nature. portionately comparable.

Additional installations, more flexible than distillation ovens, can handle peak requirements, using coke, petroleum products, and steam as raw materials. But these additional installations, despite their relatively rapid starting possibilities, cannot meet the demands of a sudden over-all consumption cem:ber. Daily and even hourly variations are pro-

To solve the problem, the gas industry uses gasometers – enormous installations which store gas during the slack hours and draw on it during the peak hours. With gasometers hourly or daily variants present no difficulty.

Seasonal variants are more problematical, and cannot be handled successfully by additional gas-generating facilities. To solve this problem, French engineers considered storing gas underground.

Back in 1953, geological studies and preparatory work were carried out to find an underground storage reservoir in the Paris region to act as a regulator for gas production and gas flow from an eastern conduit. Preliminary drillings in the Beynes region near Versailles revealed several porous layers. One of these, located 1476 feet down, seemed suitable for storing gas.

Subsequent drillings in 1954 and 1955 showed a thick bed of sand of satisfactory porosity with a volume of over 10-billion cubic feet, indicating that about 5-billion cubic feet of gas could be stored. The tests also revealed that this bed is covered by a continuous layer of clay which acts as a hermetic seal for the entire storage zone. Moreover, another layer of clay, located at a depth between 920 and 980 feet, affords additional protection. Special observation wells in the latter area would immediately detect any leakage through the lower layer of clay.

Actual construction of the project began in 1956. Major features of the program included a super-pressure and special treatment station for the gas before it is injected into the wells; 11 gas-injection drillings; a transport artery connecting Beynes to the southern belt of the Paris feeder network; and

Another new development by Iron Fireman

MicroMist

HEAVY OIL BURNER

TWO-STAGE ATOMIZER CHANGES HEAVY OIL TO AN AERATED FOG, WITH THE CHARACTERISTICS OF A GAS—NOT A SPRAY

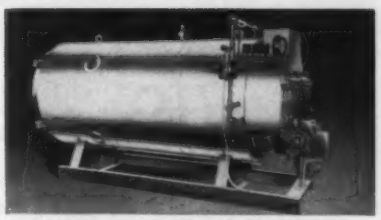
Now a medium size burner that fires low cost oils

New two-stage atomizing principle

The heart of the Iron Fireman MicroMist burner is an ingenious compressor-atomizer. The compressor reduces the oil to an air mixed spray (which is as far as other burners go) then by the heat of compression, into an air-oil vapor. The oil is so finely divided that it becomes an oil mist or fog that will remain in suspension for several hours. It is easily and directly ignited by an electric spark (does not require gas ignition). Now medium size heating plants (previously restricted to light, expensive oils) can switch to low cost heavy oil with substantial savings in fuel costs.

Note these additional features

The Iron Fireman MicroMist burner is as easily installed as a conventional gun type burner. It has two important uses. (1) As a conversion burner with any type of boiler. No special boiler front is required. (2) As a component part of a packaged boiler-burner unit. The choice of oil grades is almost unlimited (from No. 5 down to the lightest fuel oils). Integral control panel is wired and tested at the factory. Fuel and maintenance costs are low. Eliminates frequent nozzle inspection and cleaning, because of the large orifice to disperse the oil mist. Fires low-cost, heavy oils with little more attention than a domestic oil burner.



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a collecting network between the injection wells and the super-pressure and gas-treatment station.

Three terminal stations for scraper pistons have been installed where the transport artery from Beynes joins the southern belt of the Paris region distribution network, together with an expansion station and a gas-conditioning station. Nearly 14-miles long, this transport artery is made of pipe lined with epikote resins and coated with insulating lacquer and carboplast.

A special collecting network some 4-miles long, linking the 11 injection wells, is connected with the super-pressure and treatment station. The steel network tubes are specially treated on the inside to avoid corrosion and resulting pollution of the gas.

Arriving at 225 psi, the gas enters the super-pressure and treatment station through an oil-operated dust remover, ridding it of any dust particles accumulated during the 19-mile transit. Then it passes into the compression chamber, where three 400-hp compressors boost pressure to 650 psi. Heat from this operation is removed by a finned cooler, which also cools the water and oil of the compressor motors.

With oil mist eliminated, the gas is channeled to the filtering chamber, containing two prefilters and four cylindrical absorbers – 9-ft high and 5-ft wide. These are filled with a special activated charcoal which does not crumble under pressure and temperature.

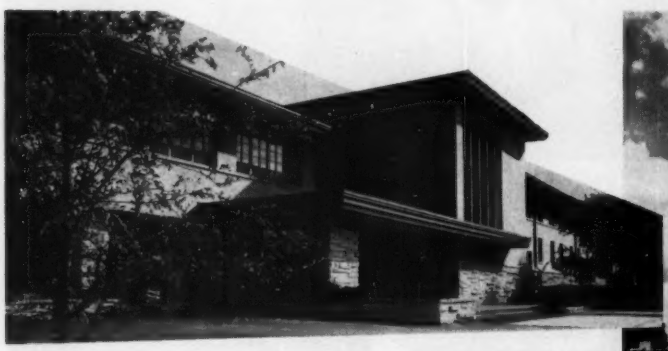
In filtering, one prefilter and two absorbers work together, while the other group is held in reserve. The prefilter takes the naphthalene, heavy benzol, traces of ammonia, and cyanide and sulphur compounds out of the gas. The two absorbers then remove completely any residual benzol and resinifiable hydrocarbons.

When the first absorber has purified 2.8-million cubic feet, it is taken out of the circuit so the activated charcoal may be regenerated.

Any gas remaining in the disconnected absorber is decompressed and driven out by steam. The steam, passing over the active coal to be regenerated, takes out liquid hydrocarbons, which are stored in tanks before being sent to refineries; polluted water, sent by tank truck to a water treatment station; and noncondensable gaseous hydrocarbons, which are burned.

Leaving the filtering chamber, the treated gas is cleansed of any traces of activated charcoal in a dust-removal chamber equipped with ceramic "candles," and the volume then is measured. Finally, the gas is compressed and forced through a steel tube into the underground reservoir.

French engineers have given Paris an exceptional gas-storage installation. Additional projects will have the Beynes installation operating before the end of 1958, and



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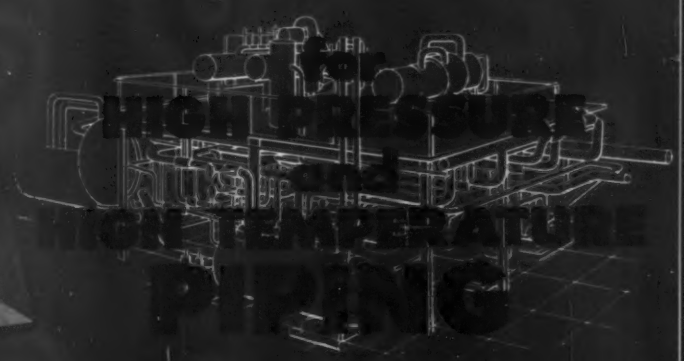

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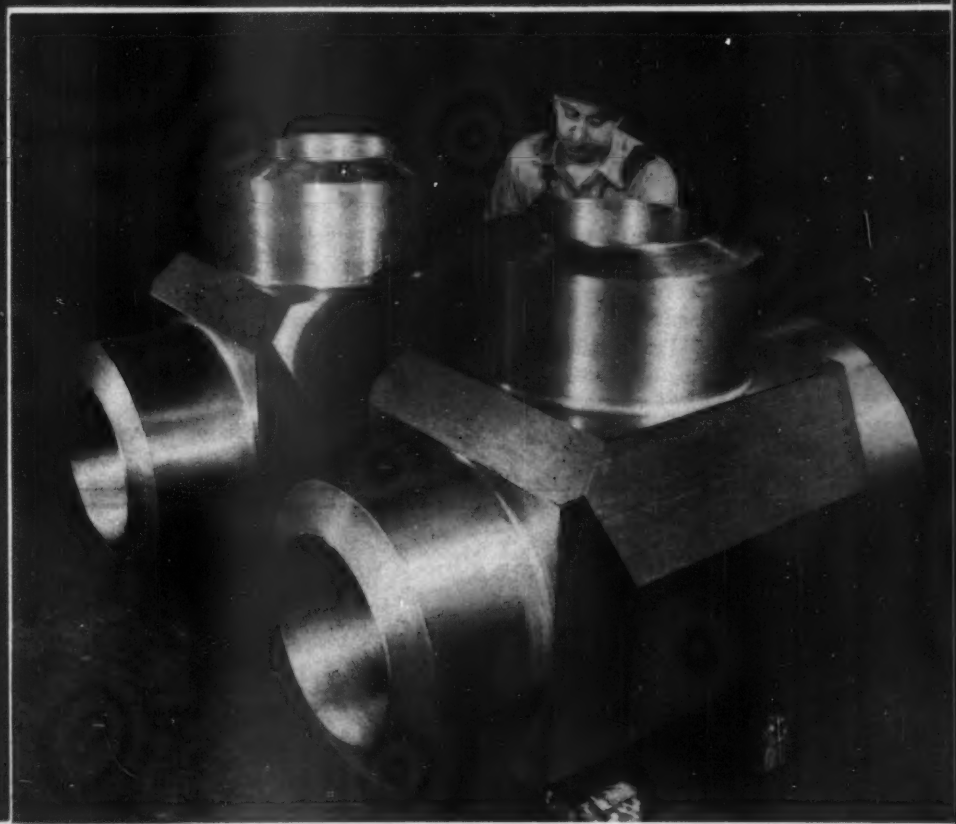

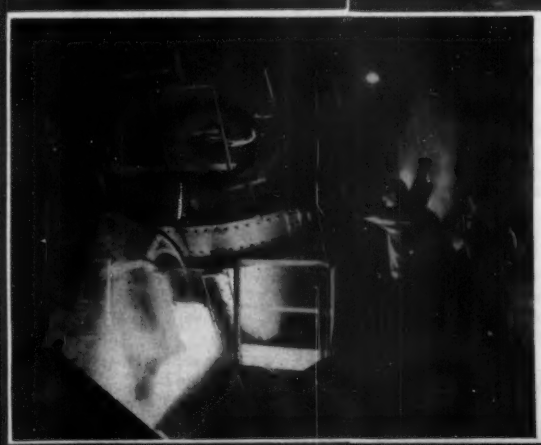

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the winter of 1959-60 will see estimated consumption demands fulfilled and even exceeded.

Tall TV Tower

A 1640-ft television broadcasting tower — higher than the Empire State Building or Eiffel Tower — is planned for Moscow, according to a Russian trade press report which discloses what it calls the "new methods and technical means" being applied in construction of this projected "world's highest tower."

Besides doubling the broadcast range of Moscow's three black and white and one color TV stations, the tower will be a tourist attraction. Fast elevators will carry sightseers up to observation platforms 885 and 1312 feet above the street.

Construction practice has no precedents in erecting a "free-standing tower 500-meters high," a report in *Novaya Tekhnika v Stroitel' stvo* (New Technology in Construction) claimed, adding that guy cables brace a 1570-ft TV tower in Oklahoma City.

(Another projected TV tower, in Tokyo, for the Nippon Television City Corporation is scheduled to rise 1082 feet including a square 241-ft antenna on top.)

The design of the Moscow tower was picked by the Soviet communications agency from several. The plans call for erection of an openwork octagonal tower of rolled steel tubing with eight spreadout base legs and a TV-radio antenna 325-ft high on top. The antenna is a square shaft prism that rises in the tower axis out of the square elevator shaft.

The octagonal tower design uses girder chords made from rolled thick-walled steel tubing 16- to 20-in. diameter, instead of welded plate steel pipes 32- to 64-in. diameter that a square tower of such height would have required, Russian estimates show.

"Total wind area of eight rolled tubes is less than that of four welded pipes. The greater number of sides also reduced the cross-bracing stress, because the lateral stress is distributed in a larger number of struts, and fewer panels collect the load in each cross-strut tier. Use of tubing simplified construction and, despite the increased strut wind area, the load on them is negligibly increased."

Construction plans call for welding all joints, assembling prestressed panels at the construction site, the topmost panel first, and then to erect the tower panel by panel, by pushing it skyward with special guiding jacks so it rises much as a bamboo shoot grows straight out of the ground. Such a method requires no scaffolding, guy cables, or other accessory equipment for bracing the tower as it rises in the air. All welding and prestressing is done before.

"To reduce wind tilting moment, tower assembly is done without the 100-meter antenna unit, without enclosing service room

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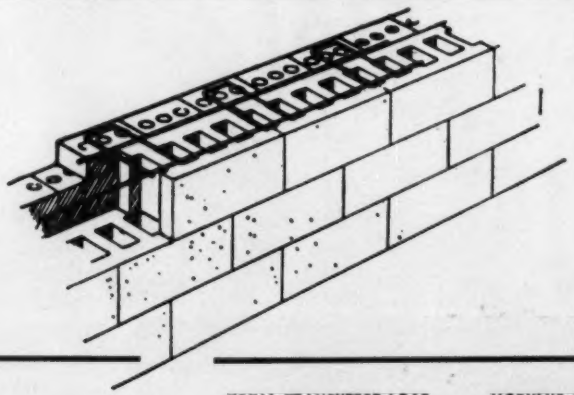

FROM ARMOUR RESEARCH FOUNDATION OF I.I.T. STUDIES:

CONSTRUCTION	WALL TIE	TOTAL TRANSVERSE LOAD POUNDS					MODULUS OF RUPTURE psi
		1	2	3	4	5	AVERAGE
4" Brk. & 4" Blk.	Header	2600	2500	2300	1800	1400	31.1
4" Brk. & 4" Blk.	Econo Lok 3/16"	5000	—	6400	3800	5200	74.6
4" Brk. & 4" Blk.	Econo Lok No. 9	4400	5400	6800			81.1

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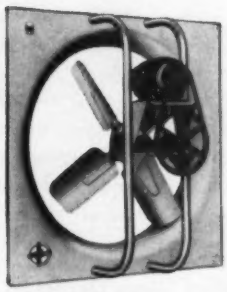
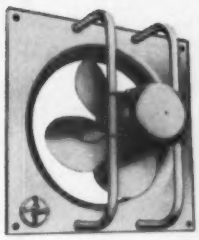
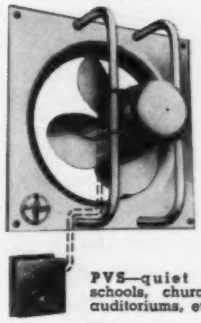


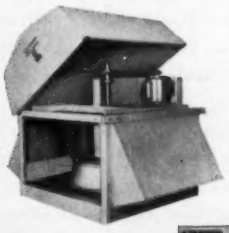
PVB—generally used in factories, warehouses and foundries.



HS—for industrial use, farm buildings, laundries, etc.



PVS—quiet for schools, churches, auditoriums, etc.



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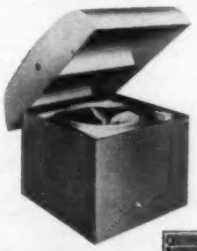
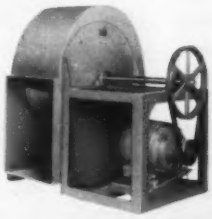
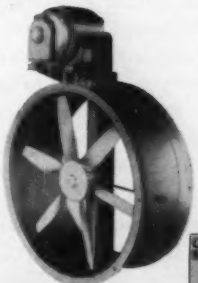


PROPELLER-TYPE ROOF VENTILATOR—for apartments, plants, schools, etc.



BACKWARD CURVE BELT DRIVE UTILITY BLOWER—recommended for general ventilation.



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structures at the tower top, and without the elevator shaft. The resulting safety factor against tilting is more than 1.3 in a hurricane wind; consequently it is not necessary to brace the tower during erection.

"After the tower proper is up, the antenna unit and elevator shaft are erected inside it by the same growing method, the tower's panel center diaphragms serving as guides during erection.

"This erection method does away with any assembly work on tower elements at a great height. All the work is done on the ground in well-equipped working positions. Hoisting machines and appliances, installed in radially arranged guides, are fixed in positions previously marked out, and represent extremely accurate assembly jigs. High quality and productivity are insured by convenient working conditions, the finished nature of multiple reiterated operations, and highly efficient mechanisms.

"Butt-welding the girder chords is by automatic welders especially developed by the Institute of Electric Welding. Cheap gas-electric welding under a carbon dioxide film will be used for the first time in welding horizontal seams of tubing.

"Panel-by-panel prestressing of all steel structures in the tower is done after girder chords and cross struts are welded, before welding up tie-rod junctions, by increasing the tower perimeter of the pertinent tier to a previously given magnitude. Such prestressing greatly improves the tower's operational qualities. No cross bracing is needed. Lack of pliable bolt connections and stressing devices will increase the tower's rigidity which improves TV quality.

"Such a polygonal all-welded prestressed tower is economically profitable and opens up great possibilities for constructing a beautiful architectural edifice. Such designs will certainly find wide application in construction of TV towers over 1000-ft high in large cities and industrial centers. Construction has begun on a 984-ft tower for the Leningrad television center. Because of its lower height it uses hexagonal rolled tubing with 0.55- to 0.79-in. thick walls."

Shipping Lanes Deepened

Vancouver consulting engineer Victor Dolmage set off nearly 3-million pounds of high explosive in Seymour Narrows recently, shattering the twin peaks of Ripple Rock, an undersea mountain long a shipping hazard between Vancouver Island and the British Columbia mainland.

The peaks, only 10 feet below the sea at low tide, had wrecked 20 large ships, 100 smaller craft, and killed over 100 people since 1875. The blast chopped the tops to 47 feet below the ocean surface at low tide.

Called the largest nonnuclear blast in peacetime history, the ex-

KOHLER ELECTRIC PLANTS

Low-cost insurance against power failure

Model 35R81, 35 KW, 120/208 volt AC. Remote starting.

Kohler electric plants fill the vital need for reliable, automatic stand-by power when storms or accidents cut off central station power.

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Complete manual, including suggested specifications, will be sent on request . . . Sizes from 500 watts to 100 KW, gasoline . . . 10 KW to 100 KW, diesel. Write Dept. B-27.

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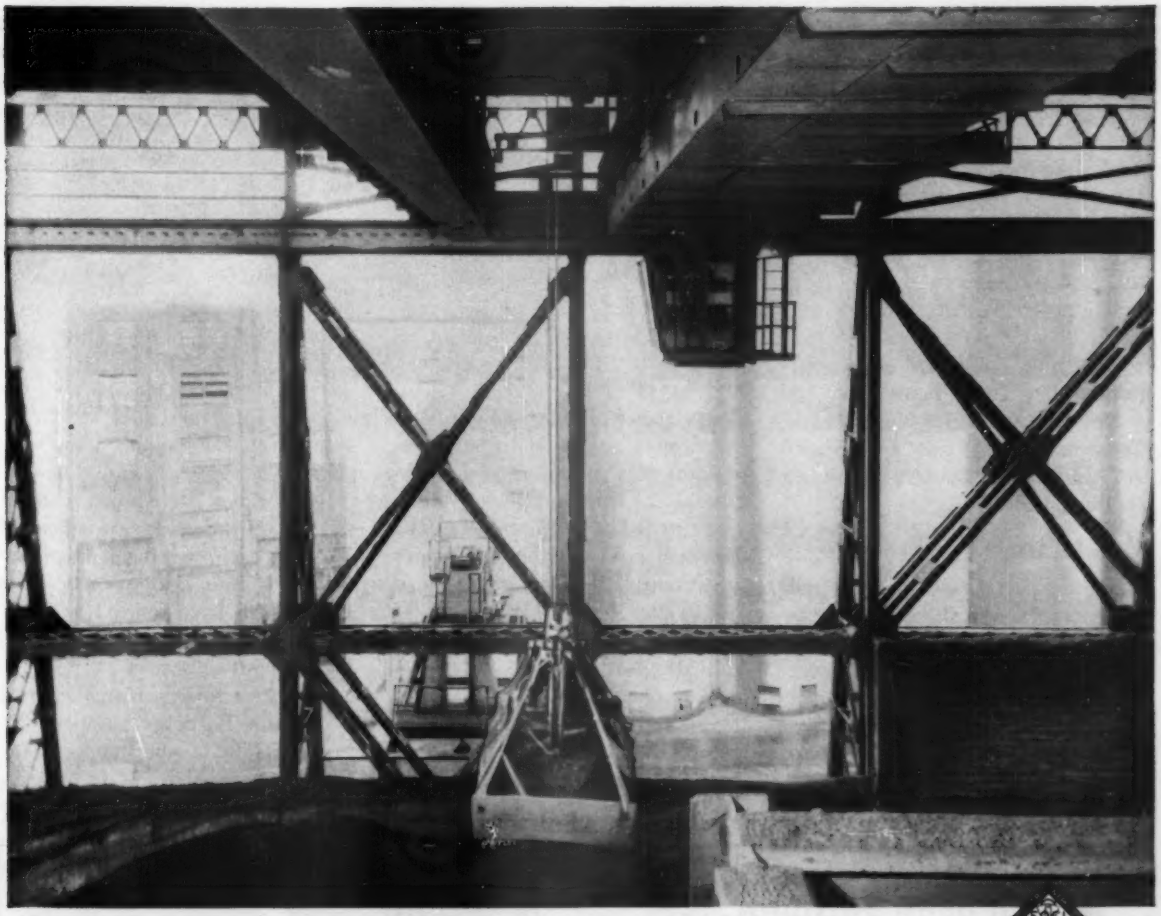

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MOVE MORE MATERIALS...FAST...AT LOW COSTS !

Whiting Engineered Cranes are quality-built to stand the gaff of full capacity operation... around the clock, if necessary. That's why Keystone Cement Company of Bath, Pennsylvania, specified this 9-ton Whiting Crane for their materials yard.

The herringbone gears in Whiting Cranes assure long life and quiet, smooth operation. Compact design and all-welded construction cut down dead weight... mean less drag, lower power cost. All moving parts are accessible for fast inspection and maintenance. Every crane is completely wired and assembled *at Whiting* to assure immediate and continued operating efficiency. And complete field service is always available.

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plosion lifted more than 700,000 tons of rock, water, and debris 1000 feet in the air.

Two years of work went into the $3.1-million project before the explosives were detonated. Preliminary engineering included a 572-ft deep shaft sunk on a neighboring island. From the foot of this shaft engineers dug a half-mile-long tunnel to a point directly below the twin peaks. There 70,000 canisters of explosives were packed into small holes.

Dolmage worked with Northern Construction Company, J. W. Stewart, Ltd., and Boyles Brothers Drilling, Ltd.

Dam for Iran

Damming the Dez River in Iran will store enough water to irrigate 250,000 acres of land on the northern Khuzistan plain, and provide power for a hydroelectric plant. The initial power plant installation will be two generators, but eventually four generators, each with a capacity of 40,000 kw, will be used. The project will include a transmission line to Ahwaz.

The dam will also furnish flood control on the Dez River and at Ahwaz, on the lower Karun River, into which the Dez flows.

Development and Resources Corporation, New York City, has signed a $150,000 contract with Electroconsult of Italy to draw up a preliminary design for the project.

Power Planning

Construction of a large hydroelectric project on the Rabagao River in Portugal is under intensive study. Cost of the dam and power station is estimated at $35 million. The dam will hold back enough water to generate 1.5-billion kw.

Bosporus Bridge

An intercontinental suspension bridge linking Europe and Asia at the Bosporus, Istanbul, Turkey, features artistic wire-strand cable stays radiating upward from the ends of the stiffening trusses at each main tower. The cables give maximum resistance to earthquake and aerodynamic forces at minimum cost.

The bridge is one of Turkey's major projects to modernize the country and its highway system. It will provide the connecting link with highways extending westward to Greece and eastward to Ankara, Turkey's capital.

The bridge will be located 3 miles northeast of the mouth of the Golden Horn and Old Instanbul, connecting European Turkey with Asiatic Turkey.

The bridge has a main span of 2215 feet and two side spans of 861 feet each, making it the longest suspension bridge outside the U.S. It will have four 11.5-ft traffic lanes, a 20-in. median strip, and two 5-ft sidewalks.

Two steel towers, rising 432 feet above the Bosporus, support the bridge. These towers stand on caissons sunk to bedrock at an esti-

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Hospitals can't afford to have equipment breakdowns. New Jersey's Bayonne Hospital is no exception.

Foster valves, recently replaced, had been in service for fifty years; others, still operating satisfactorily, for thirty and more.

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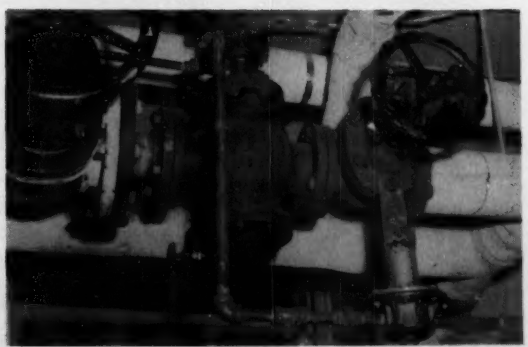
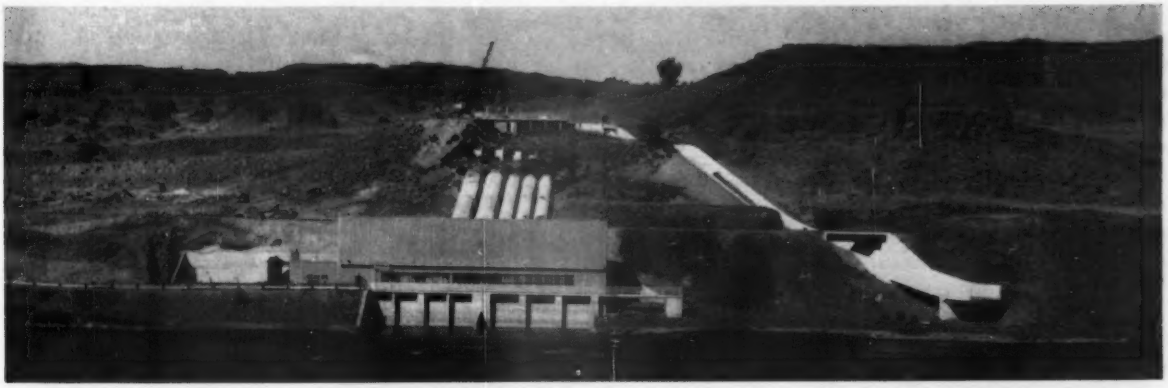
Foster 4-inch Q Valve, installed in 1920

Foster 5-inch "G" Pressure Reducing Valve, installed in 1928



Foster Remote Pilot Operated 30-G2V Valve in vacuum-pressure service, controlling reduced steam pressure feeding zone control heating system.



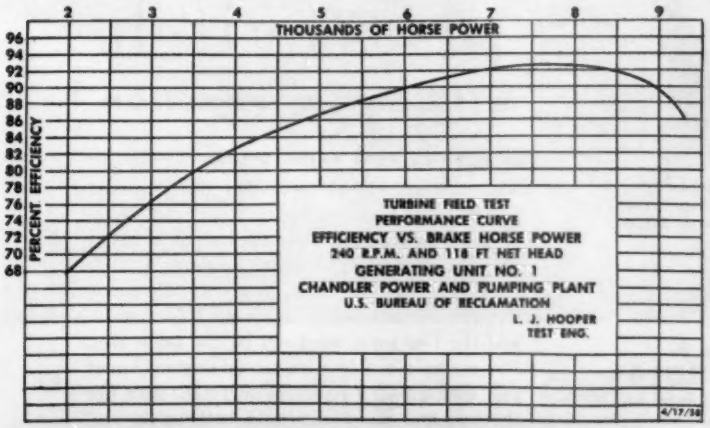
At the Bureau of Reclamation's Chandler Power and Pumping Plant, Leffel turbines drive both power and pumping units

A principal component of the United States Bureau of Reclamation's Kennewick Division of the Yakima project, the Chandler Power and Pumping Plant is situated near the junction of the Yakima, Snake and Columbia Rivers in south-central Washington.

For economy in construction and efficiency of operation the power and pumping units were combined into one structure. Two Leffel turbines each rated at 8,500 HP under 118 feet net head, speed 240 RPM, drive the generators and two Leffel turbines each rated at 2,600 HP under 118 feet net head, speed 450 RPM, drive the pumps. These turbines are all of the vertical shaft, spiral case Francis type.

When you consider turbines for your power project—whether it is a new installation or the expansion of existing facilities—keep in mind the advantages offered by Leffel . . . 96 years of experience, free engineering assistance, a large modern plant and thorough workmanship.

Write today for complete information.



One of the spiral casings for the 8,500 HP turbines on Leffel's 24' boring mill.

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mated 168 feet below water, making the tower height 600 feet above the deepest pier. The bridge has a 164-ft underclearance and a width of 1312 feet.

Construction is slated to begin this summer with completion anticipated in 1961. The bridge is designed by D. B. Steinman, New York consulting engineer.

Traveling Crane

Claimed to be the largest of its type in the world, a 185-ft high crane is used in the construction of a nuclear power station at Bradwell, England. Nearly 800 tons of steel went into the $1.1-million crane. It is mounted on eight 4-wheel bogies that run on tracks.

West Canada Steel Mill

First phase of a proposed multi-million-dollar steel development program in British Columbia, a $1.5-million 100,000-ton steel ingot mill is planned to be completed in late '58. This plant will double the former annual production of the area's only steel producer, Western Canada Steel, Ltd.

The company installed the world's largest electric induction steel furnace in 1952, making it the only all-electric steel-producing firm in the world.

Future goals include a smelter and increasing numbers of secondary industries. In addition, the British Columbia government has made extensive magnetometer surveys of nearby areas to discover new iron ore deposits. The company also has been exploring ore deposits on tidewater near Vancouver, B. C.

New Nigeria Railroad

The government-owned Nigerian Railway Corporation is carrying out an 8-year modernization and development program. Objectives are to improve the present rail system and build a new line into the northeastern provinces to provide additional capacity and a reserve for bumper crops that add up to 25 percent of normal loads. Train movements will be speeded up with better line facilities and communications; operating costs will be reduced by replacing obsolete equipment; and certain sections of the permanent way will be improved to carry heavier loads. About 240 miles of main track will be relaid, mostly with heavier rail. New stations will be built, yards and other terminal facilities extended and improved, workshops and communications modernized.

To open up northeastern Nigeria, a new 400-mile line will be built from Kuru to Maiduguri. Northeast Nigeria is potentially rich in ground-nuts and cotton for export, and grains and livestock for the domestic market. Only a fraction of its potential is at present realized because most of the roads linking it with railways cannot handle heavy traffic.

The new line will be laid largely with second-hand rail obtained

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from other parts of the system. Total cost of the railway program is estimated at $116 million. Of this, $62 million is for improvements and $54 million for the northeast extension.

Electric Trains

A new section of electrified railway track now provides fast all-electric service from Paris to the Swiss frontier. The single track, equipped with the latest electronic control devices, is one of the most modern in Europe.

The link completes electrification of the two shortest lines from Paris to Milan: one through Vallorbe, Lausanne, and Simplon; and the other via Pontarlier, Bern, Loetschberg, and Simplon.

Power Down Under

Second in size only to the Snowy Mountains hydroelectric scheme, now under construction in New South Wales, another huge power project will be started in 1964 by the Victorian (Australia) State Electricity Commission.

Powerhouses costing $225 million with generating capacity of 1.25-million kw a year will be built in the Latrobe Valley, 100 miles southeast of Melbourne. Cheap fuel is readily available from open mines with an estimated 70-billion ton reserve of brown coal. At 90 cents a ton delivered to the powerhouses it is cheaper than any other fuel.

Japanese Chemical Plants

Two major Japanese ethylene plants — a 20,000-metric-ton unit for Mitsui Petrochemical Industries, Ltd., in Hiroshima, and a 12,000-metric-ton unit for Sumitomo Chemical Company, Ltd., at Niihama, Shikoku — have gone "on stream."

Both plants make polyethylene and both were designed by Stone & Webster Engineering Corp.

A second Mitsui plant, at Iwakuni City, making phenol and acetone, and also designed by Stone & Webster, is expected to go on stream soon.

Five more petrochemical plants either have been completed recently or are under design.

More Power for Colombia

The Colombia Electric Development Institute, Instituto de Aprovechamiento de Aguas y Fomento Electrico, will spend some $7 million this year for electric development. Two-thirds of the money will come from the Institute budget with most of the rest from the municipalities interested. This program will increase Colombia's generating capacity by 32,000 kw during 1958 and add another 47,600 kw by 1961.

French Apartments

A French prefabricated housing company recently completed a five-story 50-unit apartment house in less than four weeks. Several apartments were ready to be occupied 12 days after work started on the project, and all 50 apartments were occupied 15 days later.

Floors, walls, elements of the facade, and staircases were molded in cement at the firm's factory, transported to the building site in Rouen, and there assembled by cranes and a 17-man crew. Prepared positions in the walls permitted immediate installation of sanitary units, electrical equipment, windows, and doors. Cost of construction of a three-room apartment was under $4000.

Wind-Power Prospect

Wind-measuring gages have been planted on 15 sites in Uruguay to determine the most feasible spots for wind-driven electric plants.

British engineer Edward W. Golding, who traveled 1800 miles throughout the country under the auspices of UNESCO, was optimistic about windpower: "Thousands of small windmills now generate electricity and pump water on upcountry ranches in Uruguay, but

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Earle Speed Reducers applied to operating machinery provide long trouble-free service even under adverse conditions. Earle precision design insures correctly cut gears and accurate alignment. Automatic lubrication and broad bearing gear surfaces keep wear at an absolute minimum. Result: smooth, quiet, efficient action . . . almost forever.

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Why Every Steam Heated Unit Needs its Own Steam Trap

. . . the theory, practice and proof of "unit trapping" for top temperatures

Using an individual trap for each steam heated unit, including each separate coil, chest or chamber of a machine—pays off for the user. Here are just two examples:

1. On a creamery dryer

Drainage Method	*Air Temperature*
Restricted Blow-thru	250°
Group trapping (1 trap for 8 coils)	225°
Armstrong Unit Trapping (8 traps—1 for each coil)	**309°**

2. On a platen press

Drainage Method	*Processing Time*
Restricted Blow-thru	50 minutes
Group Trapping	35 minutes
Armstrong Unit Trapping	**25 minutes**

Why Unit Trapping Works Best

It is reasonable to assume that no two steam heated units will have *identical* condensing rates. Even the slightest difference in rate will cause a difference in steam pressure drops through the units. Here's where the trouble starts. Condensate from each unit may flow to the trap. But, what about air and other non-condensibles in the system? A difference in pressure drops too small to be indicated by an ordinary pressure gauge will permit backflow of steam from the higher pressure units to the lower pressure units. This backflow of steam may even impede flow of condensate from the lower pressure unit to the trap . . . and it will definitely impede or block off flow of air to the trap. The result is sluggish heating, reduced temperatures, reduced output, fuel waste and increased possibility of corrosion. Figures 1, 2 and 3 diagram the action.

Unit Trapping Not Costly

No engineer wants any more mechanical devices in his plant than are absolutely necessary. But, the moderate additional cost of using two or more small traps, instead of one big one, is saved over and over again in improved efficiency.

If the traps are Armstrong, maintenance is no problem. And users frequently tell us that Armstrong traps outlast others two and three to one.

Steam traps usually represent a fraction of 1% of the cost of the equipment they drain. Does it make good sense to lose 10% or more of equipment capacity to save a few dollars on traps?

Why not test Armstrong unit trapping in your plant. If you are not completely satisfied with the results you can return the traps for a full refund of the purchase price. There is little to lose—lots to gain. Call your local Armstrong Factory Representative or Distributor, or write **Armstrong Machine Works, 9654 Maple St., Three Rivers, Mich.**

ASK FOR the 44-page Steam Trap Book and reprint of article on Unit Trapping.

8015T

ARMSTRONG STEAM TRAPS

How Different Condensing Rates Can Slow Production

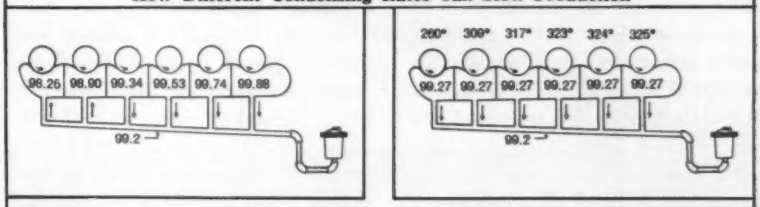

Fig. 1 This is a 6-roll ironer shortly after it has begun operating on 100 psi steam. When cold, wet material passes over chest 1, steam condensing rate is high and pressure drops accordingly. The pressure drop in chest 2 will not be as great, and so on down the machine as the material becomes progressively hotter and drier. Average pressure in the chests then is 99.27 lbs., and drain header pressure is slightly less, about 99.2 lbs. Under these conditions, steam from drain header enters chests 1 and 2 (as indicated by arrows at side of drain lines) because of pressure difference. Though condensate from chests drains by gravity, air can't leave chests countercurrent to incoming steam. Fig. 2 shows what happens next.

Fig. 2 This is the same 6-roll ironer after it has been operating a while. Air has accumulated in chests 1 and 2, reducing condensing rate and decreasing pressure drop. This process repeats itself down the line until pressures are as shown—that is, enough air will accumulate in each chest so that condensing rates and pressure drops of all chests will be about equal. The net result is shown in chest temperatures which are actual pyrometer readings taken on a 6-roll ironer, drained by a master trap, in a Chicago laundry. The laundry was making 337.9°F steam, but getting an average of only 309.6°F from the ironing surfaces, necessitating slow operation and frequent reruns. Then they tried Armstrong unit trapping—see Fig 3.

How Unit Trapping Prevents Trouble

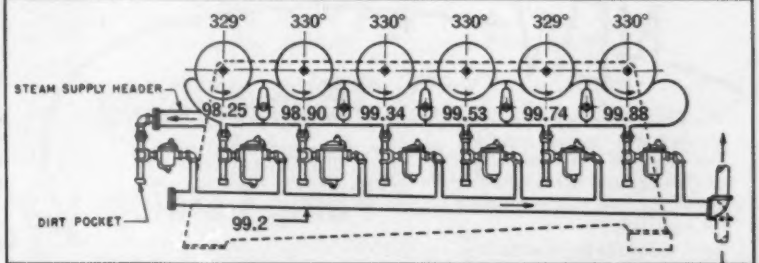

Fig. 3 This is the same 6-roll ironer, now unit trapped. Temperatures shown are also actual pyrometer readings—the average of 329.6°F is 20° higher than with group trapping. This is because air is continually removed from each chest into the drain header, and cannot get back into any chest.

bigger power plants are needed to serve whole communities."

Main source of electric power in Uruguay's cattle country is diesel-powered generators, expensive because of the high cost of fuel. Golding suggests that wind generators be added to the present network to bring down the cost of power, leaving the diesels to take over on windless days. A wind-power committee has been set up by the Uruguayan government that includes representatives of the ministries of agriculture and land settlement.

Golding is head of wind-power research at the Electrical Research Association in London and is an adviser on wind-power to countries in Europe, the Middle East, and Africa.

Canadian Atomic Power Planned

Atomic Energy of Canada, Ltd. will set up a Nuclear Power Plant Division in Toronto responsible for directing and coordinating the Nuclear Power Demonstration (NPD) project and the development program for a 200,000-kw nuclear power plant.

The development program for the power plant will take 4 years for completion. Object of the program is to demonstrate feasibility of the design and prepare a cost estimate for such a station.

Design of the NPD reactor and nuclear power plant is based on experience with the NRX reactor, using natural uranium as fuel and heavy water as moderator. Successful development of a nuclear power plant station using natural uranium will help provide a larger market for Canadian uranium.

Tyne Toll Tunnel

Plans for a $36.4-million mile-long tunnel under the River Tyne, England, have been prepared by the Tyne Tunnel Joint Committee for Northumberland and Durham.

The proposed toll tunnel will be a single two-lane roadway built near the present ferry, linked with roads to Newcastle and Gateshead-Sunderland. Combined length of the tunnel and approach roads will be 5 miles.

Tidal Power

The Federal Energy Administration of Argentina has signed a $100,000 contract with a French hydraulic firm for a study to determine whether it is scientifically and economically sound to dig a 3.5-mile channel across Valdez peninsula in south Argentina to harness Atlantic tides into a 600,000-kw power station. Besides its engineers, the company will send all equipment needed for the study.

New Belgian Highways

Until work began on the Belgian highway network to handle Brussels world's fair crowds, Belgium – despite being Europe's most mechanized country – had the continent's smallest mileage of up-to-date highways. Some 8-million Belgians were crowding 1-million cars and trucks onto the roads. But the estimated influx of 50-million fair visitors (10 million coming in cars) made extension and modernization of the highways imperative.

These roads are not being built just to handle the fair traffic. It is probable that Brussels may become the capital of the common European market, and this would mean vastly increased highway traffic. In any event, trade with neighboring countries is bound to increase, and that requires better roads.

New highways will tie in with the Ostend-Brussels and Brussels-Antwerp pikes, and multiple arterials will sweep around Brussels and Antwerp to link all borders. Other roads will run between Antwerp and the Campine coal basin, then on to Liege and the Rhineland to Koln.

An S-shaped parapet at sharp or dangerous curves will be a feature of these roads. The cement parapet turns wheels back onto the road if they veer into it. If the wheels

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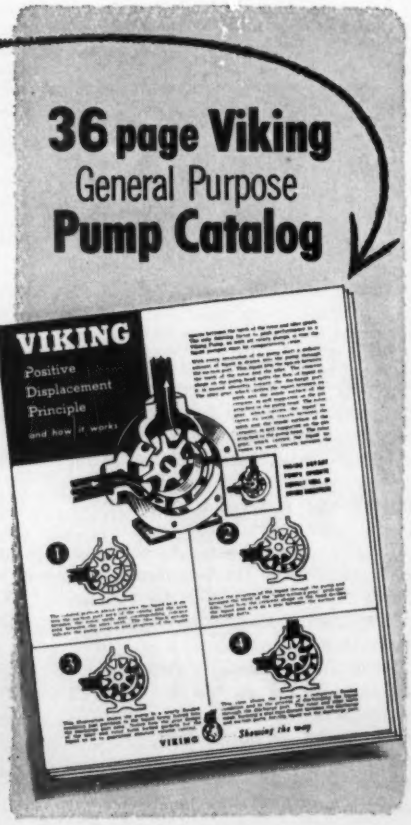

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The choice of three Webco-Ray packaged units for the 12.5 million dollar Bullock's Santa Ana store proves it again. There's *more* in a Webco-Ray packaged unit than any other package boiler made. The big plus in a Webco-Ray package is the nation-wide system of factory trained dealers who provide factory-backed local service wherever a Webco-Ray unit is installed. Webco-Ray three pass units operate at a guaranteed 80% plus efficiency. Compact Webco-Ray design also assures most efficient use of available floor space. Sizes range from 10 to 600 horsepower.

Bullock's, Santa Ana. Planning-Architecture-Engineering: Pereira & Luckman. General Contractor: C. L. Peck. Heating & Ventilating Contractor: Mehring & Hanson Co.

Webco-Ray Units Installed: 1-200 hp; 1-40 hp; 1-30 hp.

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3 PASS PACKAGED UNITS
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continue to graze the parapet, the car is stopped by the friction between the wall and the tire. A slight inward inclination of the parapets prevent cars going over the top.

Plans call for the highway program to be finished by 1969, but the major routes across Belgium will be completed long before, to make the little country one of the major crossroads of Europe.

More Gas

Gas reserves in the Sylhet field in Pakistan are estimated to be 280-billion cubic feet. An earlier estimate indicated 210-billion cubic feet, but a detailed study of all data, technical information, geological and geophysical maps by U. S. petroleum and natural gas consultants came up with the higher figure.

Power for Pakistan

The World Bank has loaned $14 million to the Karachi Electric Supply Corporation to develop electric power in the Pakistani capital area. The money will enable Karachi Electric to increase its generating and distributing load by 60,000 kw.

Work on the Baran River dam near Bannu, Pakistan is almost completed. The finished dam will irrigate 130,000 acres of barren land in Bannu district belonging to the Waziri tribesmen. Already more than 125,000 acres of land are under irrigation.

The dam, second phase of the Kurram Garhi multipurpose-hydroelectric and irrigation project, will cost more than $12.5 million.

Steep Subway

Haifa, principal town of north Palestine, is built in three tiers, rising from sea level to the top of Mount Carmel, 1000 feet up. The three districts are: the Lower Town, which contains the port and all its auxiliary enterprises and business firms as well as the town's business quarter; the Hadar Harcarmel shopping and residential quarter; and the Mount Carmel district, a rapidly growing quarter exclusively reserved for residential purposes as well as hotels.

Because of steep Mount Carmel, Haifa always has had a transport problem. Its streets and roads curve sharply as they wind up the mountain, which makes Haifa a "big" town although, as the crow flies, the three quarters are quite near each other. A short-cut — a straightline communication system, independent of the winding roads — was sorely needed.

The best way appeared to be an underground subway rather than an overhead railway. An underground tunnel obviates the need for expropriating property on the right of way; it causes less interference with existing roads and less of a nuisance in general, as well as being less noisy. Work was begun in June 1956 by the French Compagnie Dunkerquoise d'Enterprises and Solel Boneh.

Estimated cost of the project is $4.5 million, about half loaned by the Compagnie Dunkerquoise to Haifa municipality. Actual digging is being done by some 150 natives, supervised by three mining foremen of the French firm.

The subway tunnel is about a mile long, running in a perfectly straight line, and from 15 to 90 feet underground. The final rise is a steep 30 degrees, unusual for a tunnel of this type.

Work on the subway powerhouse has been started at Mount Carmel. Trains, two sets of two carriages each, have a total seating capacity of 660 passengers. They will work on a funicular system, one going up as the other descends, and will run on pneumatic tires on concrete-asphalt lanes. The whole trip, including stops at four intermediate stations, will take exactly 6 minutes. Power will be from two 675-hp motors. The six stations will be lined with marble slabs. It is expected that the subway will make about 15 million trips a year ▲▲

SPECIAL DELIVERY for liquids and gases in all branches of industry is assured with Kraloy Rigid Polyvinyl Chloride (normal and high impact) Plastic Pipe... with virtually no maintenance or policing. You install Kraloy PVC—and forget it. That's why millions of feet of Kraloy Plastic Pipe are in use today, because Kraloy PVC is inert and can never rust, rot, or corrode, is not subject to electrolytic action, handles abrasives, slurry and most Ph factors, is scale resistant. Superior flow characteristics (C factor = 150+) permit use of smaller diameters. Installation costs 50% less, due to light weight and ease of handling.

Write for complete information and literature.

KRALOY RIGID PVC PLASTIC PIPE NORMAL AND HIGH IMPACT

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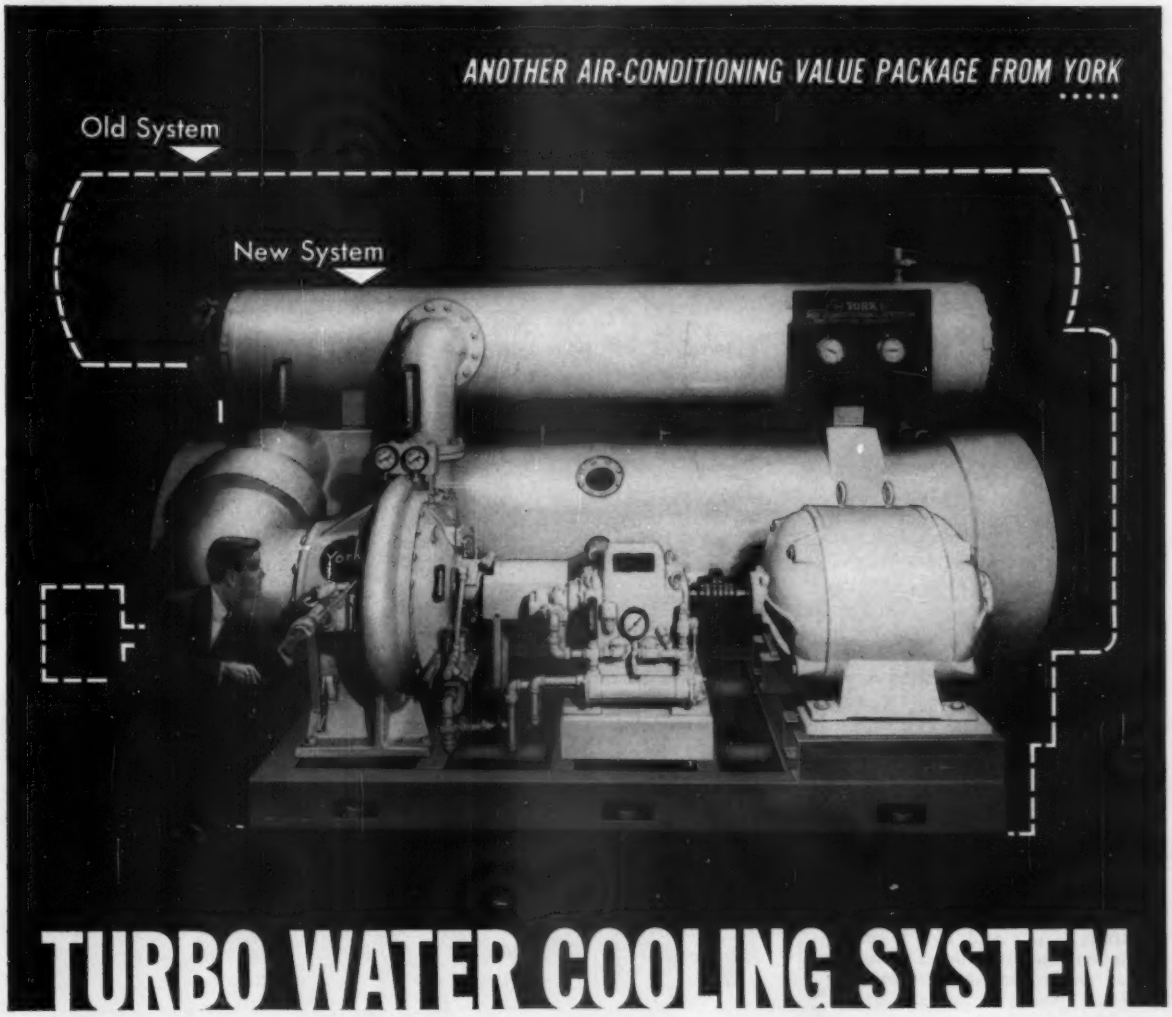
Subsidiary of the Seamless Rubber Co., a Rexall Drug Co. *Subsidiary*

ANOTHER AIR-CONDITIONING VALUE PACKAGE FROM YORK



TURBO WATER COOLING SYSTEM

- **Number of parts and deadweight cut as much as 400% over previous models!**
- **Widest range of capacities: 100 to 600 tons . . . with single-stage simplicity!**
- **Completely automatic adjustment for all load conditions insures long-run economies!**
- **Quiet, vibration-free operation!**
- **Any prime mover can be used!**

These are features that consulting engineers and contractors have long sought, and now make York's single-stage Turbo Systems an *engineered value* unmatched in the air-conditioning industry:

EASIER INSTALLATION! These compact, lightweight systems require no special foundations; occupy a minimum of space. The advanced single-stage compressor out-performs multi-stage systems twice its size . . . and does away with such equipment as flash coolers, extra float valves, extra piping and its insulation.

MORE ECONOMICAL PERFORMANCE! Stable operation under all load conditions is assured. York Turbos can be run completely by automatic capacity control . . . without supervision. Complicated control devices have been eliminated. There are no oil pumps to start.

SIMPLIFIED MAINTENANCE! The York Turbo is more nearly hermetically-sealed than any other centrifugal system. Contamination of the refrigerant is positively prevented. The use of a lightweight aluminum rotor (the only moving part)—and a small, flexible shaft coupling reduces wear. All running parts are removable as a package for inspection . . . are readily accessible without disturbing refrigerant connections!

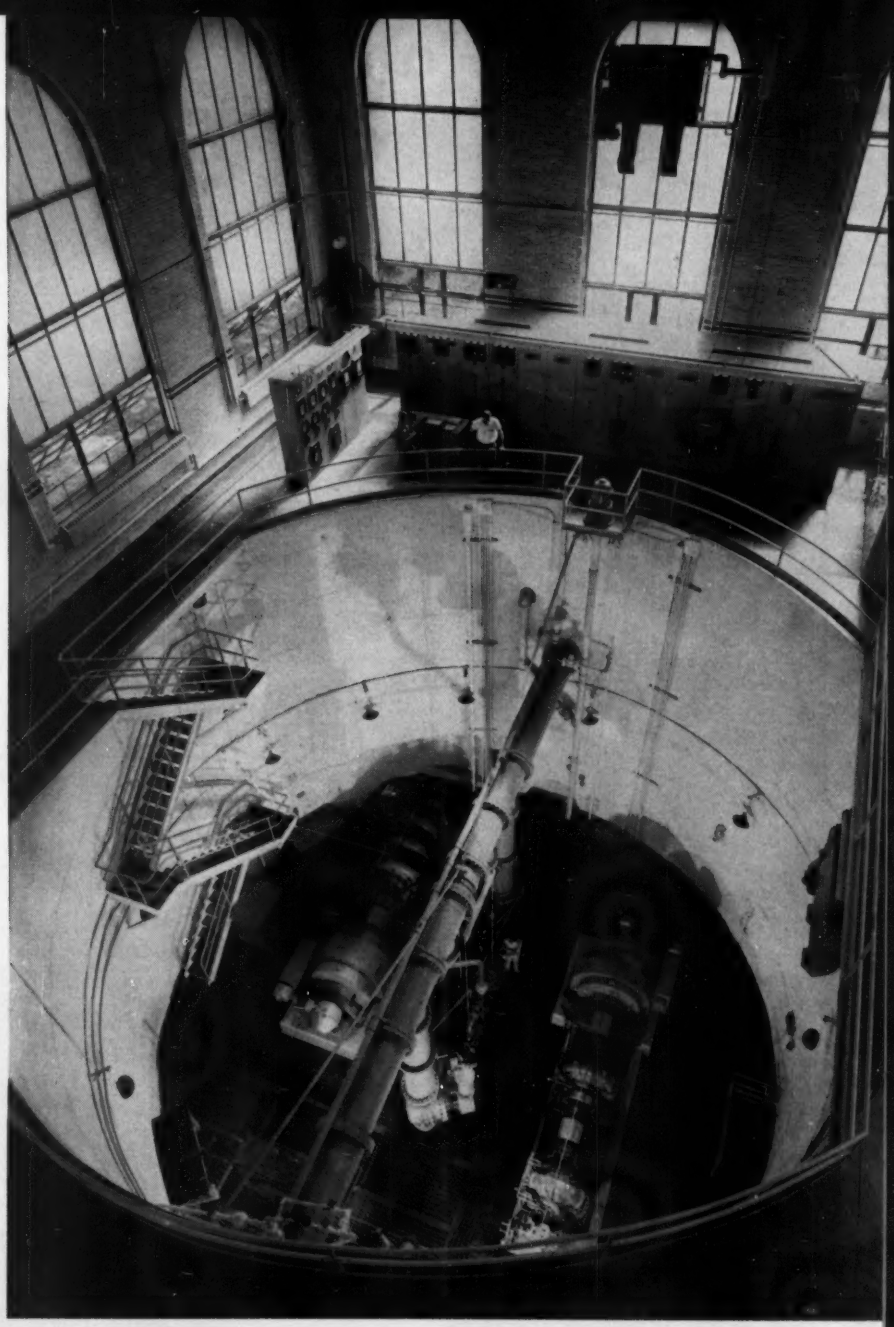
These important features are the direct result of York's tradition of designing with the *real cost* of air-conditioning in mind. They are just a few of the many you and your clients may want explained in detail. Check your classified directory for your local York factory representative . . . or write York Corporation, York, Pennsylvania.

YORK CORPORATION

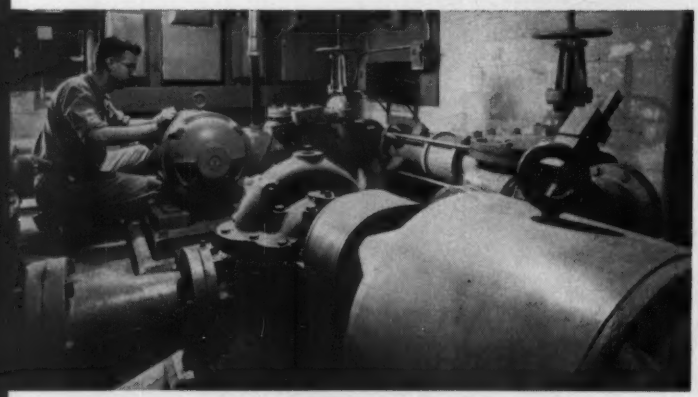
SUBSIDIARY OF BORG-WARNER CORPORATION

IN CANADA: CANADIAN ICE MACHINE COMPANY LTD., TORONTO

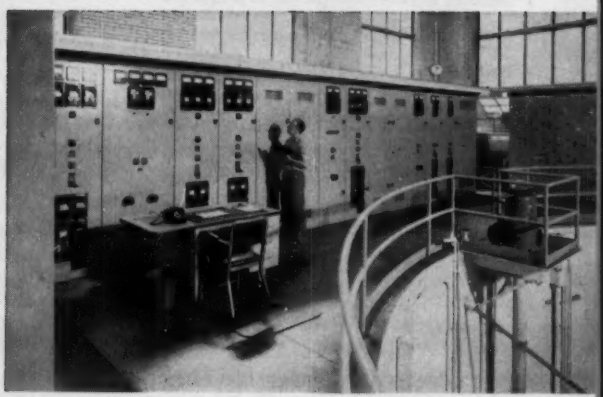
Millions Live Better with York



View at Nadine Pumping Station shows south pump pit containing pumps No. 2 and No. 3 with Westinghouse metal-clad switchgear and control center for all station pump motors in background.



Close-up view in booster station shows two 40-hp Westinghouse motor-driven booster pumps, Westinghouse safety switches, motor starters and power factor correction capacitor.



Metal-clad switchgear includes: incoming line section; starting breakers for 1000- and 1250-hp synchronous motors and their auxiliary field control cubicles; starting and running breakers and reactors for two 2500-hp motors.

Water pumping station saves $66,500 annually by Powering-Up electrically

The need for extensive modernization and expansion of water pumping facilities at Nadine Pumping Station of The Wilkinsburg-Penn Joint Water Authority brought about a complete change from steam to electric motor-driven pumps. One new 6.5-mgd pump was added to the three already in use to increase total capacity to 52,000,000 gallons per day.

In addition to the benefits of increased capacity and complete station electrification, comparative figures show a reduction in annual operating costs from approximately $268,000 to $201,500, for a savings of $66,500 per year. This represents an annual return of about 19% on the modernization cost of approximately $350,000. This fast five-year amortization of the investment eliminated the necessity of bond issues or other financing.

Besides the four new pump motors supplied by Westinghouse, the station now contains a line-up of 5-kv metal-clad switchgear, a 150-kva dry-type power center transformer, a motor control center for auxiliary power and a station battery and automatic battery charger.

The electrical Powering-Up of this pumping station has also made possible a more flexible discharge piping arrangement and the electric operation of valves and other equipment.

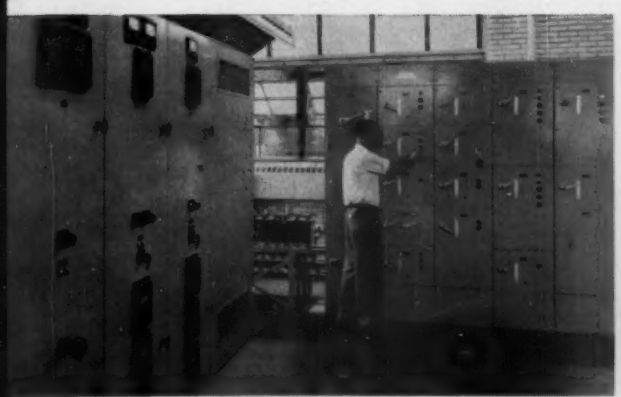
Powering-Up electrically can mean similar important benefits and savings for you. For further information, call the Westinghouse electrical construction engineer nearest you. He can help you in your Power-Up program. Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa.

Owner: The Wilkinsburg-Penn Joint Water Authority
Consulting Engineers: Morris Knowles, Incorporated
General Contractors: Dravo Corporation
Electrical Contractor: Morganstern Electric Co., Incorporated

J-94088

YOU CAN BE SURE... IF IT'S Westinghouse

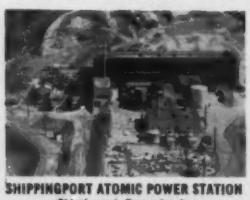
Over 250 Pages Westinghouse Data In Sweet's Construction File.



Shown at left is metal-clad switchgear feeder cubicle and 150-kva dry-type transformer. Motor control center at right contains motor starters and feeder breakers for various station auxiliaries.

Engineering group shown includes: George A. Maibach, Chief Engineer, Nadine Pumping Station; G. V. Gustafson, Morris Knowles, Inc., Consulting Engineers; M. B. Trimble, Westinghouse Construction Sales Engineer.

RECO water heating equipment picked for



SHIPPINGPORT ATOMIC POWER STATION
Shippingport, Pennsylvania
Nuclear portion of plant by Westinghouse
Operated by Duquesne Light Company, Pittsburgh
Consulting Engineers, Stone & Webster, Boston
Contractor, Pittsburgh Plumbing Company
RECO Representative, James Hood Miller, Inc.

$110,000,000 project!

Atomic power stations aren't temporary structures . . . especially when they cost upward of one hundred million dollars. All equipment must have what it takes to give decades of dependable service. So, of course we're proud that RECO copper-lined storage heaters drew the job of supplying hot water for the *nation's largest* civilian atomic electric power plant.

RECO manufactures a complete line of hot water storage heaters. Special linings are available to meet any requirement. Write for free 20 page catalog containing tables, dimensions, diagrams and details. *Address RECO, Dept. A, 7th & Hospital Sts., Richmond 5, Va.*

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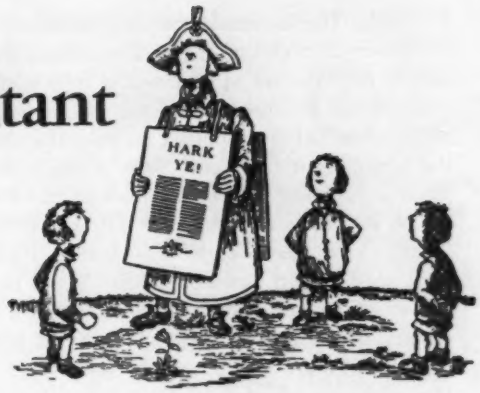
News for the Consultant



Office Buildings in San Francisco
Crown Zellerbach . . .

Rapid progress is being made on the construction of the completely air conditioned 19-story Crown Zellerbach office building in San Francisco.

When completed, this steel frame structure with all glass exterior will have a total area of 452,430 square feet, including basements, with a net office area of 220,160 square feet. The building plan is in the shape of a short-stemmed T. The cross of the T is the office section; the short-stem service portion contains elevators, rest rooms, and mechanical and electrical ducts and conduits.

There are no interior columns in the office tower, providing an uncluttered area with a clear span of 63 feet. The typical story height is 13 feet 8 inches – a detail accomplished by running the utility services through the girders.

All steel members in the office tower are fireproofed with vermiculite plaster, while the frame in the service tower is fireproofed with concrete. Service tower floor slabs and all the walls are concrete, and cellular steel deck has been used in the office tower from the third to the eighteenth floor. All concrete in the framed portion of the building is to be lightweight, except the fill on the steel decks which will be stone aggregate concrete.

The foundation is a continuous mat of reinforced concrete of several thicknesses as required to meet

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The following pages bring you the latest developments in automatic controls from Honeywell. They widen your choice of products, give you more to work with.

For complete information on these new control products and systems, call your nearest Honeywell sales office. Honeywell provides 112 offices throughout the country; each is staffed with capable control specialists to assist you in preparing proposals and writing specifications.

Look over these new products and systems. And, remember, they are backed by the kind of support only Honeywell can offer you.

FOR MORE TO WORK WITH ... WORK WITH HONEYWELL

the loads. The basement and sub-basement extend to a minus 25-ft elevation with a maximum soil pressure of 6000 lbs per sq ft. The mat type foundation was selected because of the large column loads, the office tower being supported on only 18 columns – the largest ever fabricated west of the Mississippi River – creating load concentrations to 2400 kips.

The structural steel was fabricated in Bethlehem Pacific Coast Steel Company's Alameda plant. The 63-ft span girders across the office tower are built up, welded plate girders 3-ft 6-in. deep. The secondary beams are 16 WF's spanning 22 feet. The columns also are welded and built up to an H section with over-all dimensions of 2 feet 8 inches by 4 feet 9 inches. In all, there are 8136 tons of steel in the frame or about 36 lbs per sq ft. The seismic loading is in accordance with the recently adopted San Francisco Building Code, which is based on the dynamic analysis developed by the Joint Lateral Load Committee.

H. J. Brunnier, San Francisco, is structural engineer; the mechanical and electrical work was done by Skidmore, Owings and Merrill; soil investigations were made by Dames and Moore. Four members of the staff of H. J. Brunnier presented papers on various phases of the building's design and construction at a recent meeting of the Structural Engineers' Association of Northern California.

. . . And Bethlehem Steel

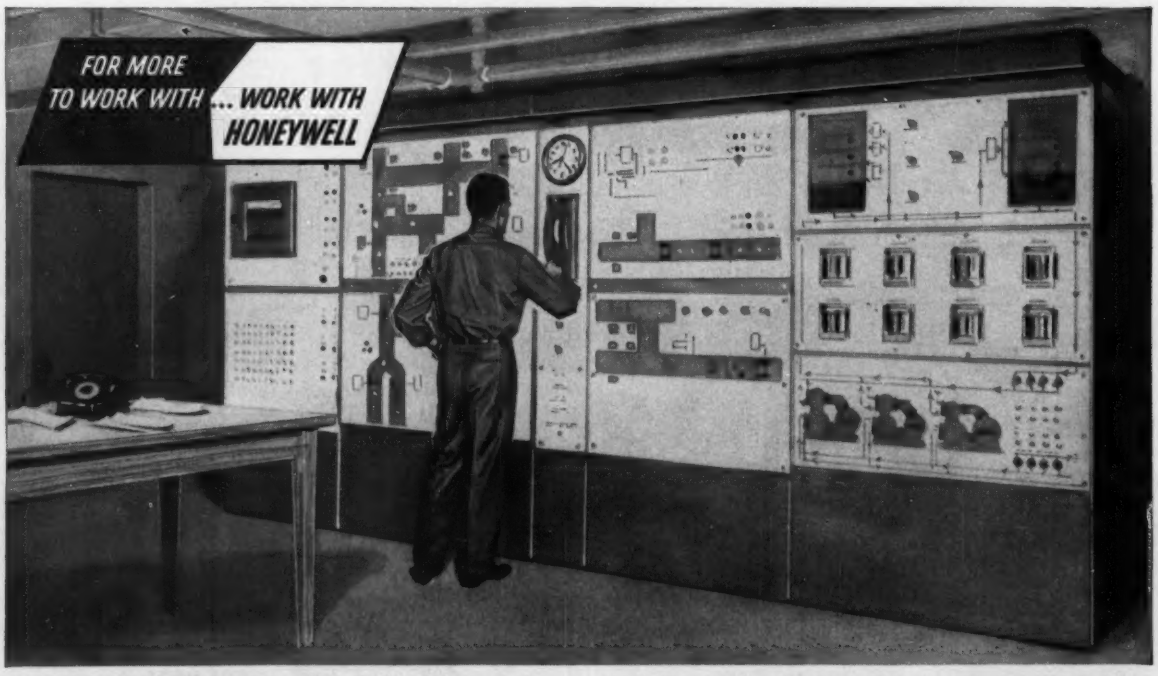
Design details of the new 15-story San Francisco office building for Bethlehem Pacific Coast Steel Corporation have been revealed. The building site has been cleared and ground breaking is under way.

Announcement of the final plans were made jointly by H. Harrison Fuller, president of Bethlehem Pacific, and Welton Beckett and Associates, the architects. Dudley Deane and Associates are the mechanical and electrical engineers; Hayes and Little, and John A. Blume and Associates are the structural engineers.

Flexibility has been achieved by planning the building on the modular principle around a central core containing the elevators and sanitary and mechanical facilities. So that offices may be made smaller or larger as needed, interior walls will be movable, and the air conditioning, lighting, and underfloor electrical and telephone duct systems will be placed so that the partitions may be rearranged without relocating these systems. Each module will be 4.6 x 5 feet, with its own recessed fluorescent lighting fixture.

A 277-volt electrical distribution system is planned for lighting economies. The 3500-kva power load will give 10 watts per square foot of building floor space.

The building is 300,000 square feet in area, with



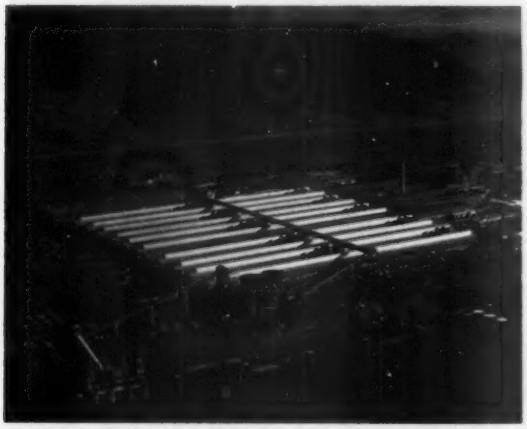
Supervisory Data Center for the Philadelphia Transportation Center, a unique 18 story building which includes offices, stores and a bus terminal. It is another in the long list of buildings to use a Honeywell Supervisory DataCenter to centrally control its entire year 'round air conditioning. Owner and Builder: McCloskey & Company; Architect: Vincent G. Kling; Mechanical and Electrical Engineers: Robert J. Sigel, Incorporated; Structural Engineers: McCormick & Taylor Associates.

approximately 19,000 square feet of space on a typical floor. It will be completely air conditioned and contain electronic elevator equipment. An automatic mail conveyor system will be installed,

Newest Aluminum Plant

A huge 180,000 tons per year aluminum reduction plant, located on a site between Clarington and Hannibal, Ohio, is scheduled for completion later this year. The new Ormet Corp. facility will cost $110 million and will be the nation's second largest aluminum reduction plant. Ormet Corp., owned jointly by Olin Mathieson Chemical Corp. and Revere Copper and Brass, Inc., now is the fourth largest producer of aluminum in the United States.

F. H. McGraw & Company, engineers and designers, are prime contractors for the project; Singmaster & Breyer are retained as consultants for all phases including electrical; Moran, Proctor, Mueser & Rutledge did the foundation investigations.



Aerial view of Ormet aluminum reduction plant.

Shippingport Nuclear Power Station Dedicated

The world's first full-scale central station nuclear power plant devoted exclusively to civilian needs was officially dedicated on May 26 by President Eisenhower. The President opened the main turbine throttle valve at the plant, located on a 420-acre site on the Ohio River 25 miles northwest of Pittsburgh at Shippingport, Pennsylvania, by remote control from the White House.

About 1500 guests attended the ceremonies, including officials of the Duquesne Light Company and the U.S. Atomic Energy Commission, joint owners of the Shippingport station, and Westinghouse Electric Corp., designer of the reactor. Representatives of 16 foreign nations also were present.

The Shippingport station consists of a pressur-

*Honeywell Supervisory DataCenter**

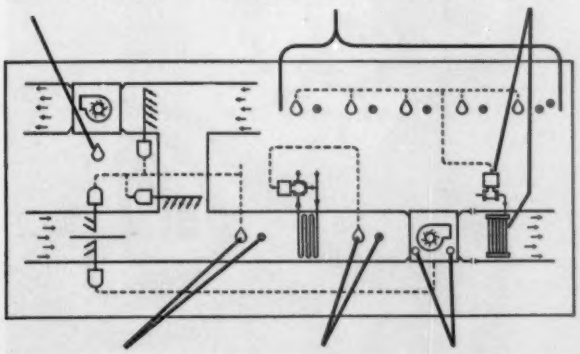
One-man control of a building's entire air conditioning system

Details from just one module of the Supervisory DataCenter in the Philadelphia Transportation Center

A. Exhaust air fan switch. Pilot light indicates operation.

B. Temp. selector knobs and check buttons for each zone.

C. Symbol for steam valve and reheater coil for each zone.



D. Temperature selector knob and check button for the mixed air temperature.

E. Temperature selector knob and check button for air leaving cooling coil.

F. Start-stop buttons for supply air fan. Pilot light in symbol indicates operation.

The DataCenter shown here is an example of the centralization of control for year 'round air conditioning systems. This panel enables one man to check and adjust the temperature at all important points. He simply pushes the check button and reads the temperature on the large indicating dial in the center of the panel. Chilled water, condenser water and cooling tower pumps, compressors, fans and valves can be operated right from the panel. System malfunctions are quickly observed and analyzed right from the panel. Repair crews can be sent to the trouble source.

A systems control center like this can give your clients more efficient operation of their air conditioning system. Honeywell can also include such other functions in your centralized panels as communications, record keeping and alarm and detection systems. A Honeywell specialist will work with you in designing a center to fit your clients' needs. *T. M.

Honeywell

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View of Shippingport nuclear power station.

100,000 kw outdoor turbogenerator installation.

ized water type reactor; four steam generators; a single turbine-generator; a radioactive waste disposal system; and associated laboratories, shops, and administrative facilities. It has been designed to produce a minimum of 60,000 kw of electricity.

The reactor pressure vessel, built by Combustion Engineering, is about 33-ft high, 9-ft inside diameter, and 8-in. thick. It contains the nuclear core, an assembly of plates and rods arranged in the shape of a cylinder 6-ft high and 6-ft diameter. The plates are enriched uranium, clad with an alloy of zirconium; the rods are hollow zirconium alloy tubes filled with natural uranium oxide pellets. The core is of the seed-and-blanket type, the enriched uranium plates constituting the seed, and the natural-uranium rods the blanket.

The nuclear chain reaction can be started, stopped, or controlled precisely by inserting or

The Honeywell Clockmaster Systems find many applications in schools, factories and offices. This photograph shows surface mounted master clock in a school principal's office. This unit is also available for flush type mounting.

withdrawing 32 hafnium neutron-absorbing rods.

The first sustained reaction at Shippingport occurred on December 2, 1957, and on December 18 the plant was synchronized with the Duquesne Light Company system, feeding power into the Pittsburgh district. The new plant first attained its full rated capacity of 60,000 kw of power production five days later.

Nuclear Submarine Simulator

A contract in connection with the prototype of a nuclear reactor powered submarine, the hull of which is being built by Electric Boat Company and the reactor by Combustion Engineering, Inc., has been awarded Charles Simkin & Sons, Inc., Hopelawn, New Jersey.

The contract includes construction of over 65,000 square feet of building floor area including housing, laboratories, and processing facilities. The project also involves mechanical systems for handling radioactive materials, with the necessary instrumentation and control; a cooling tower and extensive cooling system; electric systems, including distribution networks; plumbing; heating, ventilating, and air conditioning; and other facilities.

When completed, the installation will be able to simulate the actual conditions encountered by a submarine at sea. The piping, storage, and control facilities will include various kinds of transfer systems and provisions for handling cooling water, radioactive wastes, acid wastes, nonpotable water, compressed air and vacuum, hull bilge drainage, and diesel fuel.

Architect-engineers are Hayden, Harding & Buchanan, of Boston, Mass.

Cosmotron Contract to Burns and Roe

Burns and Roe, Inc., New York, has been awarded a design-engineer contract for the Cosmotron Experimental Area and supporting facilities, to be used in the high-energy physics research program at AEC's Brookhaven National Laboratory, Upton, New York. Burns and Roe also will procure certain critical items of equipment, supervise construction, and act as construction manager.

The new 100-ft by 180-ft experimental area will be designed to permit maximum flexibility in the arrangement of research equipment for high-energy proton investigations. To permit experimental work throughout the target area, all electrical and mechanical services – hydrogen, helium, vacuum, cooling water, and a 30,000-ampere closely regulated dc supply – will be located in walk-through underground trenches.

The target building will have automatically controlled ventilation systems to prevent hydrogen

*For your electrical systems . . . The Honeywell Clockmaster**

Now Honeywell builds and backs a complete line of time and programming systems

Now you and your clients can get the benefit of Honeywell quality and Honeywell service in both Minute Impulse and Synchronous Clock and Programming Systems. Both provide:

Handsome Clocks in 9", 12", 15" or 18" dials, flush or surface mounted.

Fully self-regulating time. Hourly time-check corrects for power-failure or errors up to 59 minutes slow or 55 seconds fast (Synchronous) up to 58 minutes slow or 57 minutes fast (Impulse).

Easy installation with standard plug-and-socket connections . . . no soldering. Mounting hangers and concealed outlets and buzzers help give pleasing appearance.

Simplified link-chain programming—easy to read, easy to understand, easy to set.

For complete information on Honeywell Clockmaster Systems call your local Honeywell office or write Minneapolis-Honeywell, Dept. CO-7-109, Minneapolis 8, Minnesota.

Trunnion mount swing-out construction permits easy installation, maintenance and program setting.

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build-ups. In addition to the target building, design plans include a mechanical equipment building to house chillers, pumps, and other equipment and a new motor-generator building to house the new power sources required.

Better Public Transportation for Los Angeles

Directors of the Los Angeles Metropolitan Transit Authority unanimously approved a contract, with a consideration of $300,000, with the New York consulting engineering firm of Coverdale & Colpitts, to provide data for expansion and improvement of its public transit system over a two-year period. The Coverdale & Colpitts contract will be administered by George W. Burpee and John E. Slater. Their studies will include a program for establishing of full-scale mass rapid transit. The engineering firm prepared original appraisal and valuation reports preparatory to purchase of existing Los Angeles transit lines by MTA.

Outstanding Record

The recent award to Smith, Hinchman and Grylls Associates, Inc. for its design and engineering of the Lincoln assembly plant in Wixom, Mich. is the third "Top Ten Plant" award in four years for the Detroit architectural-engineering firm.

Factory Management and Maintenance Magazine annually selects the 10 best industrial plants built in the nation during the preceding year. They are chosen from among some 1000 nominated.

The firm first won competition recognition with an International Business Machines plant in Endicott, N. Y., followed two years later by a winner in the Thompson Products plant in suburban Detroit, and again this year with the big facility for Ford Motor Company.

The Atom is Photographed

Arthur D. Little, Inc. reports that Professor Irwin Muller of Pennsylvania State University has photographed the atom for the first time.

Using an ultra high-powered field ion microscope of his own design, Muller was able to obtain motion pictures of atoms, magnified from 1 million to over 3 million times. One shot showed the surface of a platinum crystal with a diameter of approximately 1000 angstrom units or 1/100,000 of a centimeter. Single atoms of 2.7 angstroms diameter appeared as fine dots in a regular pattern that forms the crystal lattice of this metal.

To accomplish the photography, Dr. Muller devised a microscopically fine pointed needle which he converted into a kind of cathode ray tube. Helium ions are released from this needle at temperatures of about –425 F, which slows down atomic

The Honeywell Fire Detection and Alarm System ideally adapted to automatic fire reporting both within the building and to the nearest fire station, provides these unique features: (1) Positively locates fire by light—not necessary to count bell strokes to identify zone, (2) Dependable—transmits alarm even with ground or break in circuit.

motions. The ions strike a screen in the field ion microscope, but the surface of the emitting needle point is magnified millions of times.

This new instrument already has been used to study crystalline structure of a number of metals as well as elements such as silicon and carbon.

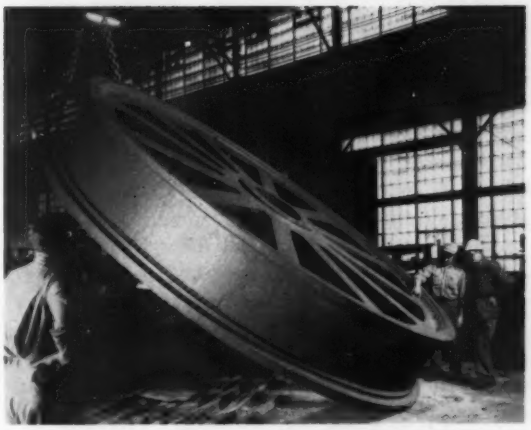
Sewage Expansion in Michigan and Montana

The Detroit Common Council has approved a $330 million expansion of sewage treatment facilities to serve the city of Detroit and the surrounding area. By 1960, it is expected the new system will provide improved service for nearly 4-million persons.

Harold Hoskins and Associates, consulting engineers, have submitted a report to the City Council of Great Falls, Montana, recommending a sewage treatment plant to cost an estimated $1,370,000 initially, including cost of plant and related collector lines and lift stations. A mechanical treatment plant was recommended as being cheaper than a sewage lagoon system previously suggested.

Longest Vertical Lift Bridge

The first of eight cast steel sheaves for the Arthur Kill railroad bridge – to be the world's longest vertical lift bridge – connecting New Jersey and Staten Island has left the Coropolis, Pa. foundry of Blaw-Knox Company. Weighing 30 tons unmachined, the casting is over 16-ft diameter and 31-in. wide. The sheaves will carry 1¼-in. diameter wire rope to raise and lower the 558-ft span. The firm of Hardesty and Hanover, New York, is consulting engineer for the project.



Cast steel bridge sheave leaves foundry.

ORR Attains Design Power Level

Oak Ridge National Laboratory's new research reactor, designated ORR, has been operated successfully at its design power level of 20,000 kw of

For your electrical systems—Honeywell Fire Detection and Alarm System

Automatic equipment, adaptable to any installation, backed by the support that only Honeywell offers!

Now a new automatic fire detection and alarm system from one reliable source—Honeywell. It offers these unique features—

- Positively locates fire by numbered lights—not necessary to count bell strokes to identify zone.
- More dependable—transmits alarm even with a ground or break in detection circuit.
- Stand-by battery provides protection even when power fails.
- Ideally adapted to automatic reporting of fires both to building supervisor's office and to nearest fire station.

In addition Honeywell assists you in planning this new system; gives you complete system inspection and checkout after installation. And from then on your clients get fast local service and maintenance from Honeywell's service organization in 112 sales offices across the country.

The automatic detector is pleasingly styled with an ivory base to blend with most ceiling finishes. It is easy to install, fits a standard 3" outlet box or plaster ring. And it has two sets of contacts which give it extra dependability.

Manual Fire Alarm Station with mercury switch gives long, dependable life. Heavy-duty construction withstands shock and vibration. False alarm caused by accidental impact almost impossible because switch must be pulled down rather than pushed in.

Honeywell

First in Controls

heat. Representing a major engineering advance over previous research reactors, the ORR achieves extremely high neutron fluxes at only a fraction of the cost of previous similar reactor types.

The research programs to be conducted with the reactor will include engineering studies on the effects of nuclear radiations on materials; basic studies on the properties of metals, alloys, and ceramics; and experiments involving neutron spectroscopy. The reactor also will be used for limited production of both short and long-life radioisotopes.

The reactor core is housed in a tank 15-ft high and 5-ft diameter, submerged in a pool 21-ft long, 19-ft wide, and 28-ft deep. Access to the core for tests is provided by openings in the concrete walls at one end and the sides, as well as from the top of the reactor and from an adjacent pool.

The ORR is a heterogeneous reactor, moderated and cooled with demineralized water. It has an average flux greater than 1 x 10^{14} neutrons per square centimeter per second, and has a beryllium-reflected core using fuel elements of uranium-aluminum alloy clad with aluminum.

Concrete Specialists Visit Russia

Six American engineers have completed a 10-day visit to the Soviet Union to inspect Russian progress in reinforced and prestressed concrete construction.

The delegation consisted of Professor T. Y. Lin, chairman, University of California, Berkeley; David P. Billington, Roberts and Schaefer Company, consulting engineers of New York; Walter H. Price, Chief, Engineering Laboratories, Bureau of Reclamation, Denver, Colorado; Ben C. Gerwick, Jr., president of the Prestressed Concrete Institute; Professor Boris Bresler, University of California, Berkeley; and James D. Piper, Portland Cement Assn.

Major laboratories and construction projects were visited in Moscow and Leningrad. It was observed that some of the major housing developments in both cities are being built principally of large precast concrete members. Assembly-line production developed for this purpose was reported by the group as "most impressive."

The engineers witnessed the testing of full-scale prestressed 100-ft members, and the construction of a 350-ft span prestressed bridge.

Reaction Turbines for Mammoth Pool Plant

Two Francis-type hydraulic turbines, to be the highest head reaction turbines in the United States, have been selected by the Bechtel Corporation, consulting engineers, for Southern California Edison Company's Mammoth Pool hydroelectric project.

The maximum static head difference between the upstream reservoir and the tailrace below the pow-

In a restaurant application, the Honeywell "Renew-Air" Filter has high absorption capacity for such objectionable odors as tobacco smoke, burning fat, fish and others likely to be present. In the past, increased outdoor air intake was necessary to diffuse these odors, which resulted in higher air conditioning costs. Now Honeywell's "Renew-Air" Filter removes the odors, enables air conditioning to be operated economically with reduced air intake.

er plant is 1110 feet. Maximum net operating head on the turbines under normal conditions is 1009 feet. Each unit is rated at 88,000 hp at 360 rpm, under an average net head of 950 feet. The turbines are of vertical shaft type, with welded-plate steel spiral cases.

Butterfly-type turbine inlet valves, with a maximum inside diameter of 90 inches have been specified. Each unit will have a pressure regulating valve, which will operate automatically to by-pass water flow temporarily during closure of the turbine wicket gates, to reduce the severity of water hammer in the penstocks.

The Mammoth Pool power plant will be located on the upper San Joaquin River, 65 miles northeast of Fresno, at an elevation of 2230 feet above sea level. The dam and turbine intake equipment are over 1000 feet higher. Because of its proximity to other plants of the Big Creek-San Joaquin River complex, the completed plant will be operated by remote control from a central location, with closed-circuit television monitoring of instrumentation.

More Miles of Interstate Highway Completed

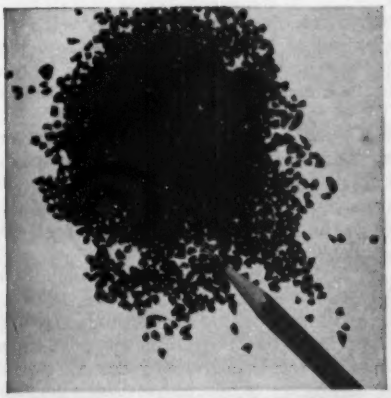
Approximately 1286 miles of interstate defense highways are completed and about 3143 miles are under construction, according to a recent survey of state highway departments conducted by Caterpillar Tractor Co. dealers. The completed mileage represents roads open to traffic.

The Texas highway department reported the most completed interstate mileage – 223. Other states leading in completed miles are: North Carolina, 144; Washington, 140; Maryland, 120; Pennsylvania, 118; Oregon, 91; Michigan, 80. New York, California, Ohio, Rhode Island, Illinois, Wyoming,

Map shows interstate highway progress.

For your mechanical systems... Honeywell's "Renew-Air" Filters

Their activated charcoal removes odors, lowers air conditioning cost!



Only the best activated charcoal is used in Honeywell's "Renew-Air" Filters. This charcoal, made from coconut shells, has more pores, more area for absorption. (Roughly, 125 acres per pound.) It is hard and durable, does not dust off or powder in service.

Here's a better, more economical solution to the problem of odors than either masking or diffusion. This new Honeywell Air Filter uses the principle of absorption by activated charcoal to filter return air, reduce the amount of intake air needed and produce savings in air conditioning installation and operating costs.

Combined with the Honeywell Electronic Air Cleaner, this new Air Filter provides air with the highest level of purity and cleanliness possible. Restaurants, hospitals and factories are only a few of the applications where this result is desired.

For convenience in specifying and installing, the Honeywell "Renew-Air" Filter is available in four different sizes and types of cells. These cells are easily removable from the frame for re-activation which Honeywell does at low cost. For further information, contact your local Honeywell office or write Minneapolis-Honeywell, Dept. CO-7-49-9, Minneapolis 8, Minnesota.

Honeywell

First in Controls

New Mexico, Minnesota, Mississippi, Missouri, and Colorado also are among the leaders in using available Federal highway funds.

Prestressed Concrete Bridge for Washington

The longest prestressed concrete bridge in the United States is being cast at Little Falls Pumping Station near Washington, D.C. The bridge is of box girder construction with a free span of 216 feet, and a total length of 281 feet. Bridge depth at the center is 7 feet, increasing in a smooth curve to a 12-ft depth at the supports.

This structure will serve as access bridge for the Washington Aqueduct, Little Falls Project, and is being constructed for the United States Corps of Engineers. Black & Veatch of Kansas City, Mo., are the consulting engineers on the project. James McHugh Construction Company, Chicago, Ill. is the general contractor.

Corrosion Resistant Transformer

To combat the corrosive atmosphere of a chemical plant adjacent to a sea coast, designers have combined a rectifier transformer and a regulating transformer into a single tank. The complete unit was arranged for direct sea water cooling using a copper-nickel cooling coil.

This transformer was installed for chlorine production at Dow Chemical Company's Freeport, Texas plant.

The result of the design was a savings in floor space of 70 percent, a reduction in cooling surface exposed to atmosphere of 90 percent, and a weight reduction of 35 percent.

New Cancer Research Laboratory

Construction is under way on the new 94,000-sq ft, $4-million Walker Laboratory of the Sloan-Kettering Institute for Cancer Research being constructed in Rye, New York by the Wigton-Abbott Corporation, engineers and constructors of Plainfield, New Jersey.

The laboratory is being erected on a 44-acre plot and will contain 100 individual laboratories constructed on a unit system. The project will permit complete flexibility of function and total adaptability for expansion or other unforeseen future needs of the institute.

The initial structure will be 331-ft long and 106-ft wide with the greater portion of the building three stories high and the remainder of the structure two stories high.

The building is scheduled for completion in May 1959. It will contain a main laboratory, administration offices, necessary service facilities, and research laboratories. ▲▲

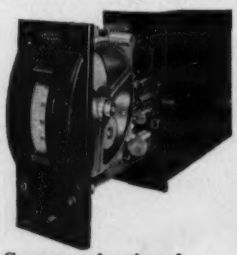
Unlimited remote temperature readings on one Honeywell Electronik* indicator

Scale shown full size. Twin hairline index prevents parallax errors.

With this new, compact indicator, the operating engineer can read temperatures at any point in an air conditioning system simply by pressing a button.

And he gets the most accurate readings known. Honeywell's indicator is accurate to plus or minus 1/5 of a degree because it's electronically precise and its rotating vertical scale—over 28 inches long—gives more than twice the indication area of ordinary circular indicators.

Private offices, zones on each floor, outside air, chilled or hot water lines all can be checked instantly on this one instrument in less than a square foot of panel space. Since sensing elements for the indicator are located right in the thermostat, connected to the indicator by low voltage wiring, there's no need for dual installation.



Compact chassis only 6½" wide. Slides out for inspection without stopping operation of indicator. *Trademark

At little extra cost, a Honeywell Systems Analyzer can be added when desired. Using the same wiring and sensing elements as the indicator, it records, on a 12-inch wide strip chart, the readings for any point or combination of points, provides a permanent record.

Honeywell

First in Controls

The Arithmetic of Materials Handling

Fuller Airveyor unloads wood flour to two forty-five foot silos. Second Airveyor system reclaims material 360 feet to processing.

General Electric Changes From Bags to Airveyor . . . Cuts Handling Costs 60%

As part of a program to increase plastics production and reduce operating costs at its Pittsfield, Mass. plant, General Electric Company called in Fuller engineers to design systems for handling wood flour in bulk.

Wood flour—used as a filler in phenolic molding compounds—was being handled in 75 and 100-pound bags. Unloading one carload of bags required 16 manhours. Bags were loaded on dollies and wheeled to a distant elevator.

SAFETY FIRST—The two pneumatic Airveyor® materials handling systems, engineered and manufactured by Fuller Company, were installed by its parent company, General American Transportation Corp., providing undivided responsibility. This installation resulted in a 60% saving in handling costs! The two systems are handled by one full-time and one part-time operator. Manhours to unload one car have been reduced from sixteen to six!

In addition, all equipment is designed to conform to strict safety specifications set down by G-E engineers.

FLOW *YOUR* MATERIALS—The Airveyor is a system that flows your material through sealed pipes. It's fast, safe, and self-contained. The pipes can be placed close to ceilings, run underground or through walls.

Whether you process wood flour—or other dry granular materials—look into the many economies of Airveyor conveying. Write today for interesting, detailed literature on Airveyor and other Fuller pneumatic materials handling systems.

FULLER COMPANY GENERAL AMERICAN TRADE MARK

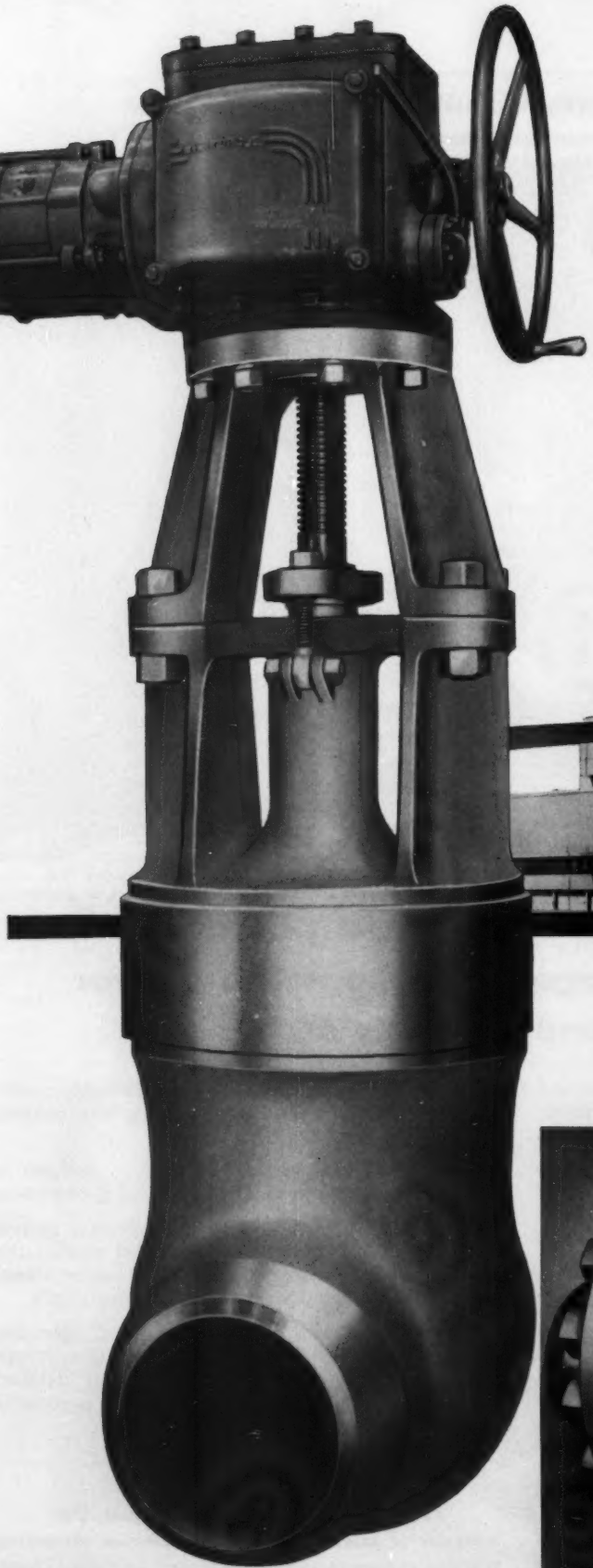
Fuller
. . . pioneers in harnessing AIR

FULLER COMPANY
118 Bridge St., Catasauqua, Pa.
SUBSIDIARY OF GENERAL AMERICAN TRANSPORTATION CORPORATION
Birmingham • Chicago • Kansas City • Los Angeles • San Francisco • Seattle

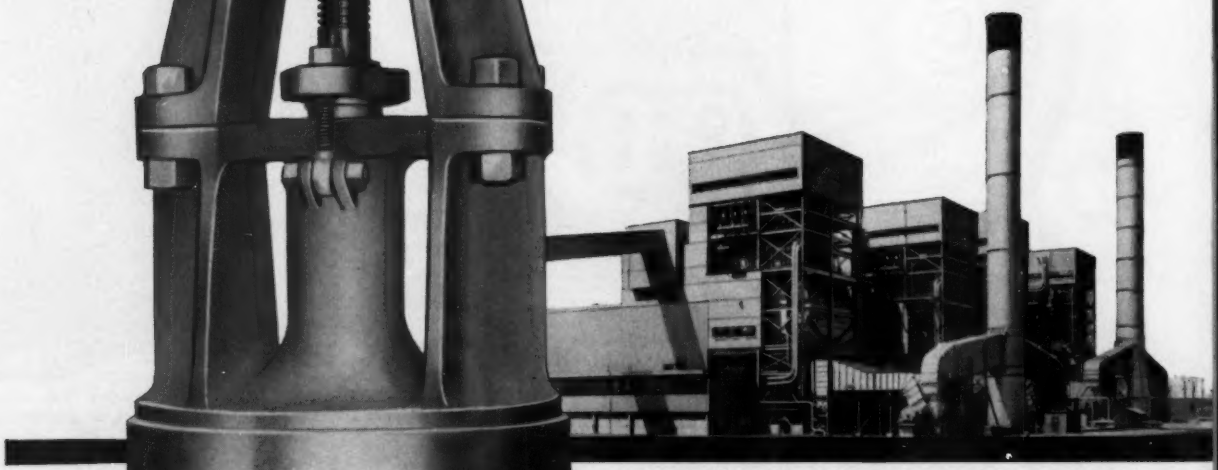
G-196
1304

"See Chemical Engineering Catalog for details and specifications".

Under pressures from 2500# to 150# psi . . .



Typical of the Chapman 2500# psi alloy steel valves used in Kansas City. Has welded body and bonnet connection and is equipped for motor operation.

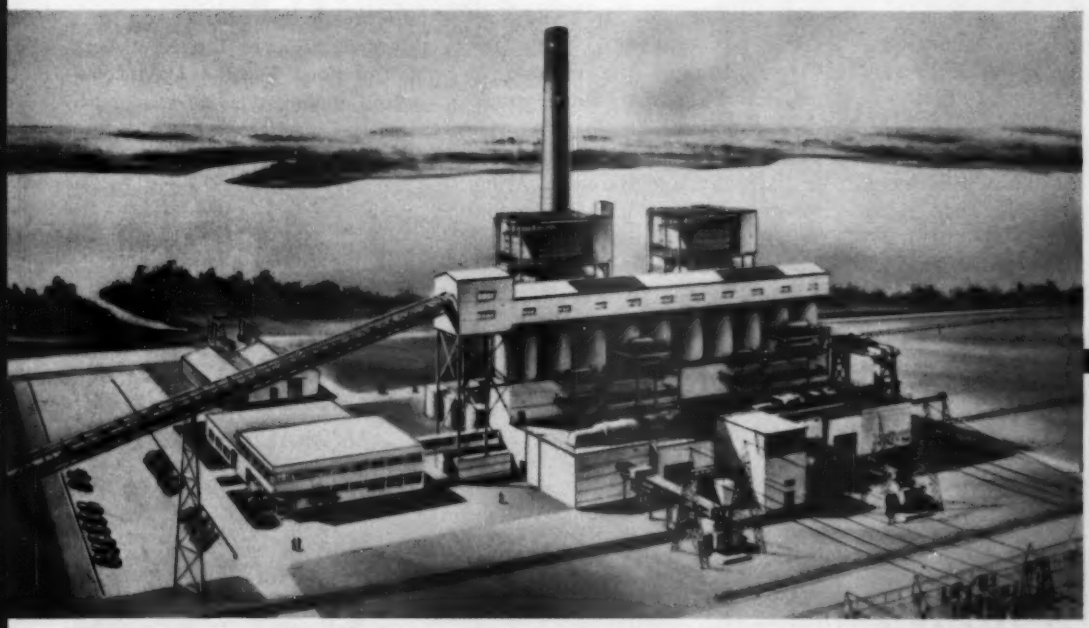


The Hawthorn Station of Kansas City Power & Light Co. located in Kansas City, Mo.

Chapman 3-piece tilting disc check valve with welding ends.

CHAPMAN VALVES

are doing a job for Kansas City Power & Light Co.



(Left) New Montrose Station, located 60 miles Southeast of Kansas City.

Ebasco Services Incorporated, acted as Engineers and Construction Managers for Kansas City Power & Light Co.

Here's a good example of what Chapman Valves can do for power plants.

In the Kansas City power plants, pressure requirements are varied . . . from 2500# to 150# psi. And Chapman Valves are meeting the specified pressure-temperature ratings . . . Chapman alloy steel gate, globe, swing check and tilting disc check valves . . . Chapman Valves, both hand and motor operated . . . Chapman Valves with welded body and bonnet or pressure seal.

In Kansas City, you'll find Chapman Valves in the 332,000 KW Hawthorn Station. You'll find them in the first brand new 156,250 KW unit at Montrose Station. You'll find them in the second Montrose unit scheduled for completion in 1960.

The reason for all this makes an interesting story. Chapman goes all out . . . 100 per cent . . . to meet valve requirements in a true engineering way. Upon request, one of our engineers will gladly talk to you about it.

The **CHAPMAN** *Valve Manufacturing Co.*

INDIAN ORCHARD, MASSACHUSETTS

For over 75 years, Chapman has been designing, developing, improving, building, testing and delivering valves to meet usual and special requirements for power plants, water works, chemical plants, refineries and industrial use.

Men in Engineering

Westcott & Mapes, Inc., Architects and Engineers, of New Haven, Conn., announce that Carl W. Taylor has been made executive vice president of the firm, in charge of all architectural and engineering services. Taylor previously was secretary of the organization.

The A. V. Smith Engineering Company, Consulting Engineers, has moved into new quarters in the recently completed Essex Building, in Narberth, Pa.

The board of directors of Ramseyer & Miller, Inc., Iron and Steel Industry Consultants, New York City, announces the election of officers: Daniel A. Sutch, president; William A. Shapiro, vice president; William P. Hindman, Jr., secretary; and Harold C. Aring, treasurer. Messrs. J. R. Miller and W. Kowalsky have resigned as officers of the company.

Robert P. Owens, former manager of the Industry Development Department of the Florida Development Commission, has joined the staff of Rader and Associates, Engineers and Architects, Miami, Fla. A registered engineer, Owens will be in charge of the Industrial Development and Engineering Dept.

Electrical Engineering Associates, Inc., Professional Electrical Engineering Consultants, announce relocation to new and larger offices at 16550 Wyoming, Detroit.

Wigton-Abbott Corporation, engineers and constructors of Plainfield, N. J., has leased the entire 26th floor of the Raymond Commerce Building at 1180 Raymond Boulevard in Newark, N. J.

The new space, which involves a floor area of approximately 11,000 square feet, will be occupied by the engineering firm's petrochemical, process, and industrial division, headed by Henry C. Day, vice president and director of the company. The division's offices are now at 45 Academy Street.

Frank E. Alderman and Frank M. Swift announce the incorporation of Alderman & Swift, Engineers. The new firm succeeds Frank E. Alderman, Consulting Engineer, and will continue with offices at 1520 Oxley St., South Pasadena, California.

William H. Kester, business economist for the Federal Reserve Bank of St. Louis and a specialist in industrial production, construction, labor markets, retail trade, and prices, has joined the New York Staff of Ford, Bacon & Davis, consulting engineers, as an economist.

KESTER EDEL

E. Ross Anderson, senior partner, Anderson-Nichols & Co., Consulting Engineers, has announced the formation of a materials-handling section. Leonard J. Edel has been appointed manager of the new department, which is located in the company's Boston offices.

Miller Engineering Company, Consulting Engineers, has moved their offices to 22 W. Adams St., Chicago 6, Ill.

Formation of the firm of Thomas & Harstad Associates, Consulting Engineers, has been announced. Principals of the new firm are Bertram P. Thomas, formerly head of the Technical Engineering Branch

A Contamination-Free Product

WITH OPW line strainers

protect pump, meter, product

Be sure! Install OPW Line Strainers in any pipe line system for a cleaner product. Tight fit of cage and screen assures product passing through strainer. Screen areas are many times pipe size for full flow. Simplicity of screen removal, cleaning and replacing facilitates periodic checkup in shortest possible time. Write for free bulletin F-36.

JORDAN CORPORATION
Industrial Sales Div. of OPW Corp.
6013 Wiehe Road
Cincinnati 13, Ohio
ELmhurst 1-1352

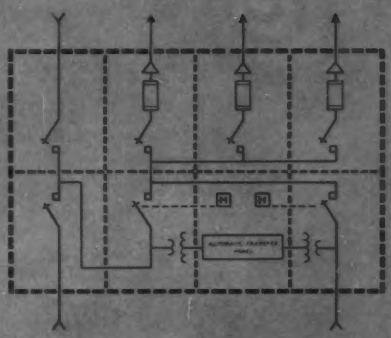
for high voltage service continuity on your critical loads at lower capital outlay— it's S&C Metalclad Switchgear!

To get service continuity on critical loads, you need preferred-to-emergency switching of your alternate incoming high-voltage supply circuits, and short-circuit protection and switching on your outgoing high-voltage supply feeders. All of this can be provided in one low-cost package in S&C Metalclad Switchgear, as illustrated.

You even have built-in choices of throwover schemes through S&C's standard automatic transfer panels.

You save two ways:

1. You get metalclad switchgear with job-matched load interrupters and power fuses, in lieu of costly circuit breakers.
2. You eliminate cost of custom designing by using an off-the-shelf transfer panel with built-in options.



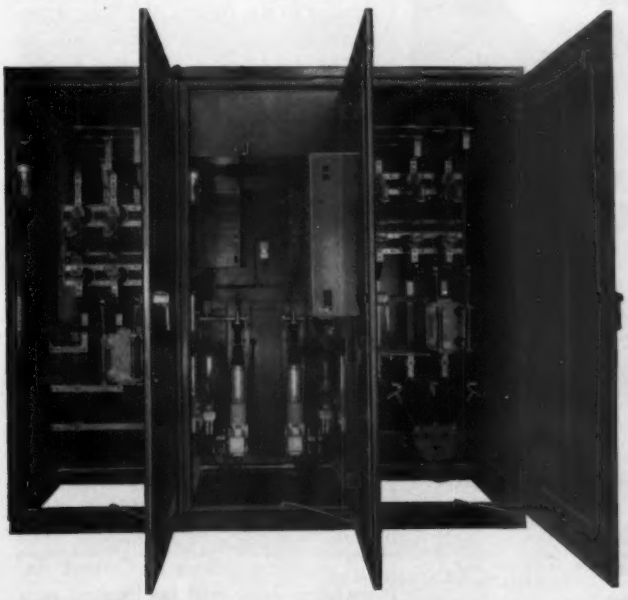
Schematic for 8-bay switching center unit (above) shows throwover control of 2 of 3 alternative incoming sources to provide continuous service for three outgoing feeders.

S&C Standard Automatic Transfer Panel provides for making either source preferred, for automatic or manual return, for adjustable time delays, for choice of returning in either open or closed transition, and for optional lockout on bus faults.

No organic insulation to cause corona trouble; porcelain and air only.

High-Speed Automatic Switching.

Full-length bulkhead doors; rainproof, with complete access.



Super Durabake finish with galvanized and stainless steel hardware; withstands corrosive atmospheres.

Separate compartment for Moto-Draulic operators; free access and decoupling for checkout.

Strip heaters with adequate venting prevents moisture accumulation.

Power Fuses
Tool Operated Disconnects
Open and Enclosed Cutouts
*Fuse Links
*Loadbuster
Load Interrupters
Metalclad Switchgear

S&C ELECTRIC COMPANY
4436 Ravenswood Ave. Chicago 40, Ill.

In Canada: S&C Electric Canada, Ltd.
8 Vansco Road, Toronto 14, Ontario

of the U. S. Army Corps of Engineers, North Pacific Division, Portland, Oregon, and Howard T. Harstad, for many years a Seattle consulting engineer. Offices are at 1000 Lenora St., Seattle.

The new firm was established to render professional engineering services in the electric power generation and distribution field. Bastian J. Qualheim is assistant chief engineer. David B. Diehl, Robert W. Okey, Robert H. May, James W. Porter, Arthur Lie, and James A. Nelson are project engineers.

Beman & Candee, Consulting Engineers, announce their new office location at 154 West Huron St., Buffalo, N. Y.

Two former U. S. naval officers, Captains Thomas H. Urdahl and Paul S. Bauer, have formed the professional engineering firm of Urdahl Associates. Others associated with the Urdahl firm are Lawrence N. Gonzalez, projects director, and Robert B. Keating, executive engineer and foreign representative.

Bennett and Straight, Inc., architect-engineers, have relocated offices to 23830 Michigan Ave., Dearborn, Michigan. Personnel previously located at five different addresses now are in a single office.

Walter S. Miles, formerly of the public relations staff of Parsons, Brinckerhoff, Hall & Macdonald, has joined the organization of D. B. Steinman, Consulting Engineer. Prior to his association with PBH&M, Miles was employed by the Virginia Bridge & Iron Co. of Roanoke, Va. where he began his career. When U. S. Steel acquired the firm, he was assigned to the American Bridge Company.

Louis S. Booth has been elected a director of Lockwood Greene Engineers, Inc., Engineers-Architects of Boston, New York, and Spartanburg, S. C.

Robert S. Boyd, former manager of the evaluation division of the Pittsburgh, Pennsylvania Railways Co., has been appointed manager of the appraisal division of Stone & Webster Engineering Corp. Boyd joined Stone & Webster as an appraisal engineer in 1956.

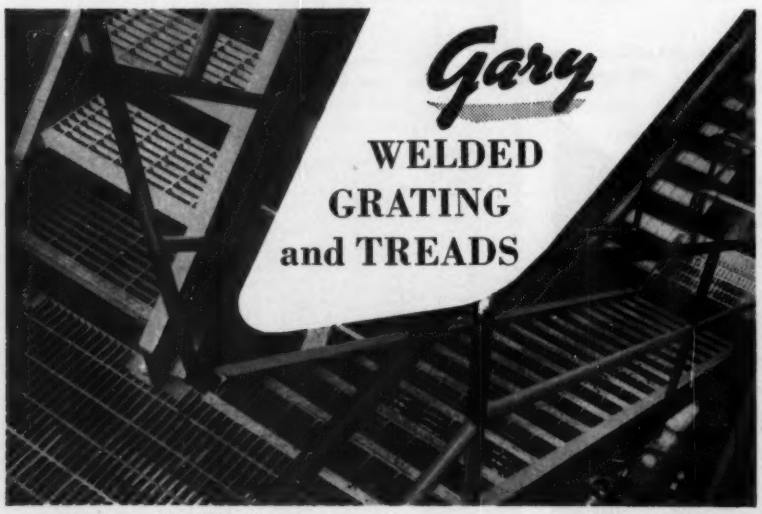
Fred W. Argue, vice president and engineering manager, said Boyd will head the division which conducts appraisal work for clients in all fields of business – commercial, industrial, and public utility – and for many branches of the government.

BOYD SHERMAN

Zachary Sherman, consulting engineer, announces the opening of offices for the practice of professional engineering at 3387 Poplar Ave., Memphis, Tenn. The firm will specialize in the design of heavy structures, such as bridges, deep foundations, foundations for heavy machinery, industrial buildings, and prestressed concrete. A "Contractor's Advisory Service" also will be offered for methods of excavation, sheeting, and bracing for deep excavations, concrete formwork. underpinning, dewatering, inspection, and supervision of construction.

Guillermo Villena, civil engineer, formerly with Alfred LeFeber and Associates, has opened offices to be known as G. E. Villena, Engineers. The temporary address will be at 5506 North Glen Ave., Cincinnati, Ohio.

All Reading offices of Gilbert Associates, Inc., will be located in a new building at 525 Lancaster Ave., Reading, Pa. ▲▲



Get all the facts. Write for Bulletin CE-78

- TAILOR MADE—for most economical installation.
- RIGID STRENGTH—sturdy resistance-welded construction.
- LIGHT WEIGHT—for greater load bearing capacity.
- SELF-CLEANING—for reduced maintenance costs.
- OPEN CONSTRUCTION—gives maximum ventilation and illumination.

ROCKWELL-STANDARD CORPORATION
GRATING DIVISION
4015 East Seventh Ave. • Gary, Indiana
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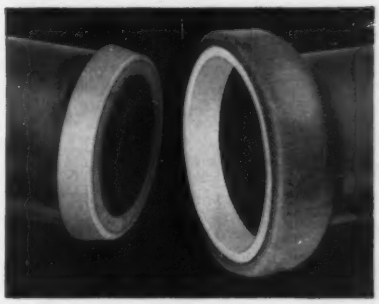
lower installation costs FIVE WAYS with longer, stronger AMVIT Clay Pipe

Outstanding Mechanical Joint of Plasticized Resins of Polyvinyl-Chloride Gives Lower Cost-In-Place



A million dollar expansion program to increase production facilities for Amvit* was completed earlier this year. New horizontal extrusion machines now manufacture pipe in over four feet lengths.

Longer lengths lower installation costs, reduce the number of joints, lessen the number of pipe sections to be handled. *Here's how you can save on installation with Amvit:*

1 SAVES LABOR

No other materials such as caulking, joint compounds, hot pots or ladles are needed to make the Amvit Joint. The joint is on the pipe delivered to the job ready for use. Nothing else is needed. Just push the pipe together and the joint is complete.

2 IMMEDIATE BACKFILLING

As soon as the joint is made, backfilling can start. No need to wait for unnecessary delays caused by bad trench conditions, high-water table, unstable ground or running sand. Barricades can be removed and streets opened days sooner.

3 QUICK TESTING

No need to wait days to see if a line has passed test. A look at the completed joint will tell. Thus, engineers can inspect and accept the line allowing the contractor to receive payment quicker.

4 PERMITS DEFLECTION, ABSORBS SHOCKS

Amvit is made from a plastic which has many characteristics similar to rubber. It is pliable, permitting deflection without leakage. It is resilient, can absorb shock and vibration. This allows for settlement of pipe in poor ground conditions after backfilling.

5 COMPLETE FITTINGS

Amvit is furnished on all standard fittings, as well as pipe. This will permit a uniformly tight line from house wall to treatment plant.

Amvit line being installed in Amherst, Ohio

For more information on how Amvit can help cut your sewer project costs, write or call American Vitrified Products Company, National City Bank Building, Cleveland, Ohio, or our office nearest you.

SINCE 1900

AMERICAN

American Vitrified Products Company

CLEVELAND OHIO

MANUFACTURERS OF: Clay Pipe, Flue Liners, Clay Liner Plates and Concrete Pipe.

*T. M. Registered.

Plants Across the Nation... Brazil, Indiana • Chicago, Illinois • Cleveland, Ohio • Crawfordsville, Indiana • Detroit, Michigan • East Liverpool, Ohio Fenton, Michigan • Grand Ledge, Michigan • Lisbon, Ohio • Los Angeles, California • Milwaukee, Wisconsin • South Bend, Indiana • St. Louis, Missouri • Whitehall, Illinois

B. F. Goodrich
B.F.Goodrich
DELUXE
Silvertown

rides with coal

Tire manufacturer enlarges steam facilities; continues coal for economy, reliability

At its Oaks, Pa. plant, The B. F. Goodrich Co. uses steam principally for curing tires. When increased demand for its tires created the need for plant expansion in 1954, B. F. Goodrich found its original boiler plant could not supply sufficient steam. Completely new equipment was installed to increase capacity. But B. F. Goodrich continued to burn the economical fuel it had used in the past—coal.

In this modern coal-burning steam generation system, coal handling, ash disposal and the entire furnace operation are automatic. As a result of this modernization, fuel costs and manpower needs have been held to a minimum. And, in four years of operation, this installation has required only routine maintenance and repairs.

Facts you should know about coal

You'll find that bituminous coal is not only the lowest-cost fuel in most industrial areas but up-to-date coal burning equipment can give you 15% to 50% more steam per dollar. Today's automatic equipment can pare labor costs and eliminate smoke problems. And vast coal reserves plus mechanized production methods mean a constantly plentiful supply of coal at stable prices.

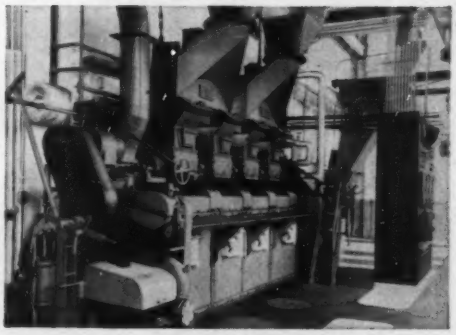
Technical advisory service

All companies planning a new power plant, or the remodeling of a present one, should consult an engineering firm on its design and construction. As a matter of fact, every Bituminous Coal Institute advertisement advises its readers to take this step. When you have such a project, our Engineering Staff will be glad to assist you in your fuel cost survey with any coal information you may require.

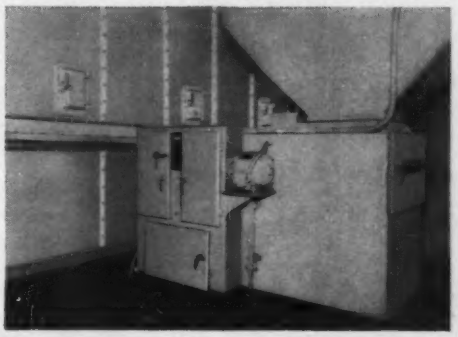
Meanwhile, we believe you will be interested in our informative case history booklet, complete with data sheets. Write to the address below for your copy.

BITUMINOUS COAL INSTITUTE

Department CE-07,
Southern Building, • Washington 5, D. C.



View of 100,000 lb/hr Wickes Boiler at B. F. Goodrich, fired by Detroit Rotograte Stokers. Coal is gravity fed from overhead bins through weighing equipment into stoker hoppers. Conveyor system is by Stock Equipment Co.

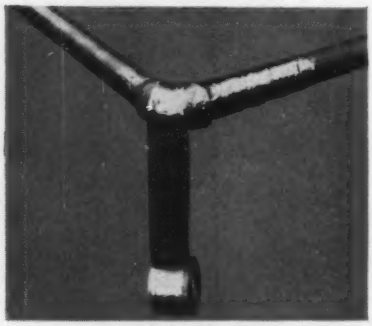


Shown here are overhead feeder and Stock coal-weighing equipment. This operation is all automatic. Coal goes from here to stoker.

Close-up of Stock coal elevator, conveyors and swinging spout used to stock out coal. Ash silo is part of United Conveyor ash handling system.

Coal storage area, showing level, compacted coal pile. Coal is stocked out from swinging spout by bulldozer, which later reclaims it to the track hopper for conveying into power plant.

For True Economy... MEASURE PIPE PROTECTION WITH A CALENDAR!



Why Engineers Specify TAPECOAT ...The Quality Coal Tar Protection in Handy Tape Form for

Pipe	Tanks
Pipe Joints	Insulated Lines
Couplings	Splices
Fittings	Sprinkler Systems
Conduit	Bridge Crossings
Cables	Tie Rods

. . . in underground or under-water service

Since 1941, TAPECOAT coal tar coating in tape form has proved itself the best possible protection at lowest possible cost. Pipe and other surfaces TAPECOATED 17 years ago show no signs of deterioration—a record unmatched by any other type of tape.

Field application costs are lower with TAPECOAT because it is so easy to apply with the use of a torch. No tar kettles, technical know-how or special crews are required. TAPECOAT comes in rolls of 2", 3", 4", 6", 18" and 24" widths—sized to the job.

A TAPECOAT sales and service engineer is available at all times to assist you on any corrosion problem and on the various applications of TAPECOAT.

Write for illustrated brochure.

The **TAPECOAT** *Company*

Originators of Coal Tar Coating in Tape Form

1569 Lyons Street
Evanston, Illinois

Representatives in Principal Cities

New Projects Reported

By Consulting Engineers

CALIFORNIA

Cline, Zerkle & Agee
Berkeley, California

¶ Laundry building, San Francisco, Calif. (civil, struc., mech., elec.) $100,000. Client, Acme Towel Supply Company.

¶ School building addition, Guadalupe, Calif. (civil, struc., mech., elec.) $100,000. Client, Guadalupe Union School District.

COLORADO

Henningson, Durham & Richardson
Colorado Springs, Colorado

¶ Asphaltic concrete paving and appurtenances, Cortez, Colo. (civil) $600,000. Client, City of Cortez.

CONNECTICUT

Howard W. Harper
Southport, Connecticut

¶ Trumbull High School, Trumbull, Conn. (elec.) $3 million. Client, Lyons & Mather, Arch.

¶ Easton-Redding Regional High School, Redding, Conn. (elec.) $1 million. Client, Lyons & Mather, Architects.

¶ Bristol High School, Bristol, Conn. (elec.) $3 million. Client, Lyons & Mather, Arch.

¶ Private residence, Greenfield Hill, Conn. (elec.) $250,000. Client, Roswell F. Barratt, Arch.

¶ Riverfield School, Fairfield, Conn. (elec.) $400,000. Client, Lyons & Mather, Arch.

¶ Electrical renovation of dairy plant, Bridgeport, Conn. (elec.) $25,000. Client, Mitchell Dairy Co.

¶ Brian McMahon High School, Norwalk, Conn. (elec.) $3.5 million. Client, Lyons & Mather, Arch.

¶ St. Francis of Assisi Church, Wilton, Conn. (elec.) $200,000. Client, Lyons & Mather, Arch.

Robert S. Loomis, Engineers
Windsor, Connecticut

¶ North End High School, West Hartford, Conn. (struc.) $4 million. Client, Warren Ashley, Arch.

¶ Puritan Maid Restaurant, West Hartford, Conn. (struc.) $60,000. Client, C. Frank Bayek, Arch.

¶ Clarence Carroll Hall, New Britain Teachers College, New Britain, Conn. (struc.) $245,000. Client, Kane & Fairchild, Arch.

FLORIDA

Briley, Wild & Associates
Daytona Beach, Florida

¶ Preliminary survey for county-wide water and sewer project including treatment. (civil) $12.5 million. Client, Board of County Commissioners, Volusia County.

¶ Sewage treatment plant, interceptor sewers, pumping stations, and lateral sewers. (civil) $900,000. Client, City of Palatka, Fla.

¶ Water supply, treatment and distribution system, sewage collection and treatment plant. (civil) $420,000. Client, Town of Callahan, Fla.

¶ Water treatment plant. (civil) $90,000. Client, Lake Placid, Fla.

¶ Water supply, elevated tank, and miscellaneous. (civil) $200,000. Client, City of Holly Hill, Fla.

¶ Water transmission mains. (civil) $530,000. Client, Clearwater, Fla.

GEORGIA

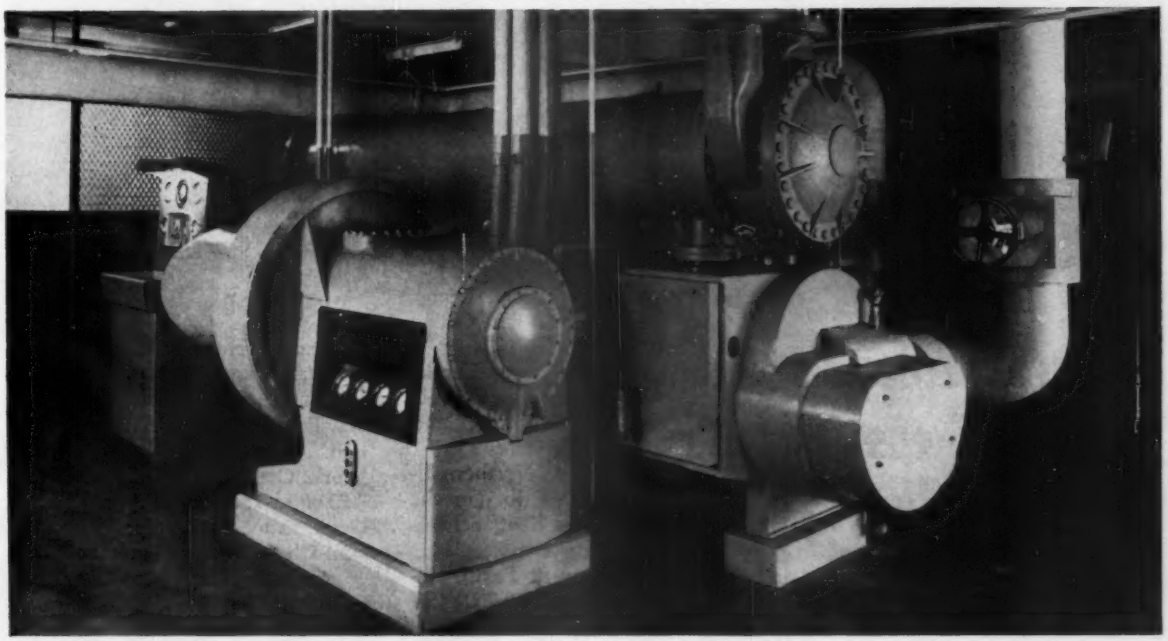
Patterson and Dewar Engineers, Inc.
Decatur, Georgia

¶ Four-lane highway location sur-

Carrier
Hermetic Centrifugal
Refrigerating Machines

now in a complete range of sizes

90 to 1100 tons



Carrier Hermetic Centrifugal Machines are available in a wide range of capacities in each size, with a choice of motor horsepowers and voltages, to meet the most exacting refrigeration load requirements in air conditioning and process cooling applications. In addition to economical selection with performance matched to specific job conditions, the Carrier Hermetic Centrifugal offers important advantages:

It combines weight savings. space savings and efficiency better than ever before achieved in a large refrigerating machine.

It runs smoothly and quietly; can be located on the roof of a building or in the basement without a heavy or costly foundation.

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It has mechanical simplicity. The motor-compressor unit, hermetically sealed against air, moisture and refrigerant loss, is factory assembled on a single shaft.

Whatever your refrigeration requirements, there is a Carrier specialist in your area to assist you with the selection.

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Carrier air conditioning · refrigeration · industrial heating

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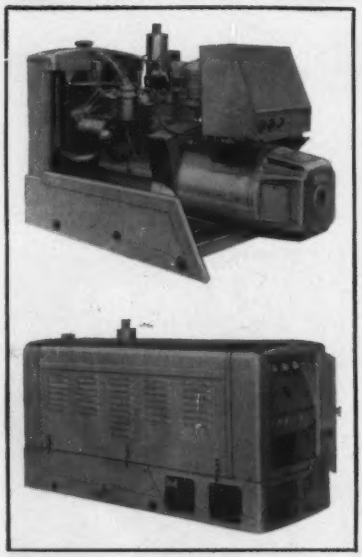
ELECTRIC PLANT
NEWS



Onan develops new low-cost standby plants

Water-cooled units in 10 and 15 KW sizes meet rigid requirements

A new series of water-cooled electric plants makes Onan reliability and advantages available at significantly lower prices. The new units are powered by the same rugged, industrial-type engines used on more expensive plants. They have close inherent voltage regulation, operate on either gas or gasoline, and are equipped with all necessary controls and instruments, and high water temperature cut-off. Standard Onan accessories are available.

The Onan revolving armature, all-climate generator is direct-connected and self-aligning. All standard voltages are available. Both sizes are offered unhoused or with handsome weatherproof steel housings.

Write for specifications

Onan
ELECTRIC PLANTS

D.W. ONAN & SONS INC.
2746A University Avenue S. E.
Minneapolis 14, Minnesota

vey and design, including underpass and providing connector between existing heavy traffic arteries. (civil) $400,000. Client, DeKalb County, Ga.

ILLINOIS

Abraham Engineering Company
Alton, Illinois
¶ Water supply, distribution system, and treatment plant, Madison County, Ill. (civil, mech., elec.) $300,000. Client, Board of Trustees, Forest Homes and Maple Park Public Water District, Wood River Township.
¶ Sewage treatment plant alterations and expansion of facilities. Village of Bethalto, Ill. (civil, mech., elec.) $75,000. Client, village board.
¶ Water treatment plant, Village of Bethalto, Ill. (civil, mech., elec.) $75,000. Client, village board.

S. Alan Baird
Peoria, Illinois
¶ Addition to high school, Dixon, Ill. (mech., elec.) $1,225,000. Client, Gilbert Johnson, Arch.
¶ Addition to boiler plant, Eureka Williams Corp., Bloomington, Ill. (mech., elec.) $150,000. Client, owner.
¶ Women's dormitory, Northern Illinois University, DeKalb. (mech., elec.) $4.2 million. Client, Schaeffer, Wilsoxi & Evans, Arch.
¶ Y.W.C.A. building at Pekin, Illinois. (mech., elec.) $250,000. Client, Foley, Hackler, Thompson and Lee, Architects.

IOWA

F. L. Pulley
Des Moines, Iowa
¶ National Travelers Life Insurance Co. office building. (mech., elec.) $1.5 million. Client, Wetherell & Harrison.
¶ Lutheran Children's Home, Waverly, Iowa. (mech., elec.) $100,000. Client, Woodburn & O'Neil.

MASSACHUSETTS

Robert S. Loomis, Engineers
Windsor, Connecticut
¶ Springfield Trade School, addition to shop, Springfield, Mass. (struc.) $100,000. Client, Elroy Weber, Arch.

NEBRASKA

Henningson, Durham & Richardson
Colorado Springs, Colorado
¶ Comprehensive report on sewage treatment, sanitary sewers, and waterworks. (civil) $500,000. Client, City of Scottsbluff, Nebr.

NEW MEXICO

Dr. Marcello Giomi & Associates
Albuquerque, New Mexico
¶ Federal Savings & Loan offices, Gallup, N. M. (mech.) $150,000. Client, Kruger, Lake & Henderson, Architects.
¶ Army reserve training centers, Silver City and Las Cruces, N. M., Las Vegas, Nev., and El Paso, Texas. (mech.) $800,000. Client, Lawrence Garcia, Arch.
¶ Furr's Cafeteria. (mech.) $100,000. Client, George R. Graves, Arch.

NEW YORK

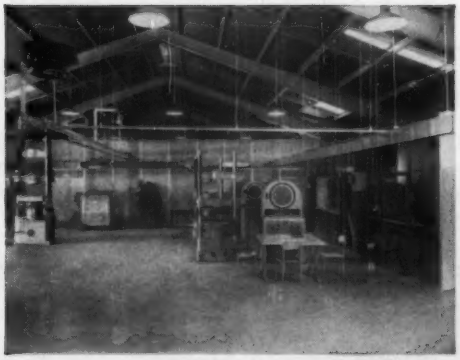
O'Brien & Gere
Syracuse, New York
¶ 50 mgd sewage treatment plant. (civil, struc., mech., elec.) $12 million. Client, Onondaga Public Works Commission, Syracuse, N.Y.
¶ 10 mgd sewage treatment plant. (civil, struc., mech., elec.) $1.5 million. Client, City of Poughkeepsie.
¶ Intercepting sanitary sewers and intercepting chamber. (civil, struc.) $800,000. Client, City of Poughkeepsie, N.Y.

Henry J. Campbell, Jr., P.E.
Mineola, New York
¶ General Foods Corp., offices, factory, service department, Floral Park, N.Y. (mech., elec.) $150,000. Client, Alfred J. Lowe.
¶ Newgarden apartments consisting of 7 buildings housing 112 units, Edmunton Gardens, Babylon, N.Y. (mech., elec.) $900,000. Client, Harold Nosow, Arch.
¶ St. Phillip Neri Church, Northpoint, N.Y. Alterations to provide 8 additional classrooms. (mech., elec.) $150,000. Client, R. F. Meissner, Arch.
¶ Hogan Industrial Supply Corp., Carle Place, N.Y. New warehouse

Temporary Engineering Building No. 1. West Virginia University, Morgantown, West Virginia

THIS PRE-ENGINEERED BUILDING

was planned and completed in 6 months



Temporary Engineering Building No. 2. This Butler building was erected at the same time as the larger building above and serves as a testing laboratory for engineering students. Note the clear, overhead space, the column-free floor area permitting use of moveable partitions.

A raging fire destroyed Mechanical Hall at West Virginia University. Even though a new 10 million dollar agriculture-engineering plant was on the drawing boards, temporary facilities were needed quickly. Within six months school engineers designed the building above, the Butler components were shipped from stock and the building was completed and ready for occupancy.

Fast construction is just one of many advantages Butler pre-engineered components offer. Pre-engineered to meet applicable building codes, they save much tedious routine engineering. Mass-produced, they eliminate custom fabrication. Butler's clear-span, column-free interiors afford full utilization of space. Ventilation and illumination can be controlled easily, economically, to provide a superior environment. Future expansion is fast, easy, and economical.

For full details on the advantages and economies that Butler pre-engineered building components offer, contact your Butler Builder. He's in the Yellow Pages under "Buildings" or "Steel Buildings"... or write direct.

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CALIBRATED DIAL
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4201 Belmont Ave., Chicago 41, Ill.

and office building. (mech.) $150,000. Client, Warren & Otto Sambach, Engineers.

Lloyd W. Weed
New York, New York
¶ Parish house addition, Methodist Church, Hempstead, N. Y. (struc.) $250,000. Client, W. R. Shirley.
¶ Grade school addition, Union Free School District No. 2, Town of Eastchester, N. Y. (struc.) $800,000. Client, W. R. Shirley, Arch.

David R. Wittes
Philadelphia, Pennsylvania
¶ Shopping center, Hicksville, L. I., New York (civil, struc.) $250,000. Client, Sabatino & Fishman, Architects.

NORTH DAKOTA

K. B. MacKichan & Associates
Grand Forks, North Dakota
¶ Municipal sidewalk, Lakota, N. D. (civil) $50,000. Client, City of Lakota, N. D.
¶ Curb, gutter, and asphalt paving, Anamoose, N. D. (civil) $100,000. Client, City of Anamoose.
¶ Sewage collection system with stabilization lagoon, Emerado, N.D. (civil) $60,000. Client, Village of Emerado.

OHIO

William Schuller, Consulting Structural Engineer
Toledo, Ohio
¶ Educational building, St. Marks Evangelical Lutheran Church, Van Wert, Ohio. (struc.) $192,000. Client, Hoke & Nickerson, Arch.
¶ Highland Lanes Bowling Alley, Toledo, Ohio. (struc.) $145,000. Client, Robert E. Martin, Arch.
¶ Henry County engineers' building, Napoleon, Ohio. (struc.) $150,000. Client, Hahn & Hayes, Arch.
¶ Murphy medical building, Toledo, Ohio. (struc.) $81,000. Client, Richard F. Brown, Arch.

Friebel & Hartman, Inc.
Shelby, Ohio
¶ Sewage treatment plant, Mansfield, Ohio. (civil, struc.) $3,837,000 (est.). Client, City of Mansfield.
¶ Ohio Bell central office building, Upper Sandusky, Ohio. (civil, struc.) $134,000. Client, Ohio Bell Telephone Co.
¶ Ohio Bell Telephone Co. addition, Tiffin, Ohio. (civil, struc.) $154,000. Client, Ohio Bell Telephone Co.
¶ Warehouse and manufacturing building, Shelby, Ohio. (civil, struc.) $530,000. Client, F&H Realty Co. for lease to American Machine & Foundry Co.

Mayer & Valentine
Cleveland, Ohio
¶ Maternity and medical buildings, Akron City Hospital, Akron, Ohio. (mech.) $750,000. Client, Akron City Hospital.

Willard F. Schade & Associates
Cleveland, Ohio
¶ Water works improvements. (civil, struc. mech., elec.) $350,000. Client, Village of Newton Falls.

The Osborn Engineering Company
Cleveland, Ohio
¶ Engineering services for layout and design of pier protection installations for Cuyahoga River bridges, Cleveland, Ohio. (civil, struc.) $500,000. Client, County of Cuyahoga, Cleveland, Ohio.

Emmet J. McDonald and Associates
Akron, Ohio
¶ Design Rhodes Avenue widening, relocation, and resurfacing. $240,000. Client, City of Akron, Ohio.

OKLAHOMA

Fred S. Dubin Associates
Hartford, Connecticut
¶ St. Gregory's Monastery, Shawnee, Okla. (heating, ventilating, plumbing, electrical, sanitary) Client, Murphy & Mackey, Arch.

OREGON

Cornell, Howland, Hayes & Merryfield
Corvallis, Oregon
¶ Design water system improvements including water line, reservoir, pumping station, and changes to existing pumping station, Agate Beach, Ore. (civil, struc., mech., elec.) $65,000. Client, Agate Beach Water District.
¶ Design 12-lane bowling alley. Structure to have glued laminated

with Dracco *Airstream* Conveyors you can:

handle any dry bulk material . . .

Airstream Conveyors handle hundreds of materials from fine powders to 2-inch lumps: grains, cereals, chemicals, fertilizers, plastics, pulverized rock products. Self-cleaning systems can move two or more materials in quick succession to proper destinations without intermixing.

move it anywhere . . .

Airstream Conveyors move materials **to, through** and **from** production processes. Walls and floors are no obstacles . . . pipelines can be installed out of the way without costly supports and are easily adapted to any new or existing plant layout. Airstream versatility permits bulk material flow in any direction, at any angle and at any desired handling rate.

. . . **with less labor** through elimination of costly manual handling. Most systems require only part-time supervision of one man.

. . . **lower material cost** by permitting bulk-buying. No material is wasted or spoiled from moisture or contamination.

. . . **greater safety** with no hazardous moving mechanical parts and no exposure to toxic materials.

. . . **and cleanliness** since Airstream systems are completely enclosed, dust-free and self-cleaning.

For the profitable answer to your bulk handling problem, call in a Dracco engineer soon. Write or call:

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New 32-page brochure presents detailed information on how Dracco Airstream Conveyors have solved bulk materials handling problems. Write for Bulletin 530.

DRACCO *airstream* conveyors
dust control equipment

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but not the light

Hendrick Mitco takes the brunt of heavy, continuous industrial or pedestrian traffic without bending or warping. Yet, its 90% open area lets in plenty of light and air. Mitco is pressure-formed to give it this high strength—and as a result, extremely long life. For more information, write direct to your local sales office.

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Sales Offices in Principal Cities

roof beams, block walls with structural concrete columns. Heating system entails gas-fired boiler operating a direct forced air system. Corvallis, Ore. (civil, struc., mech., elec.) $75,000. Client, Recreation, Incorporated.

¶ Preliminary study of interceptor sewer for Laurel Springs area in S.W. Salem, Ore. Includes pump station. (civil, struc., mech., elec.) $170,000. Client, City of Salem, Ore.

¶ Major study of water system supply, storage, and distribution, Corvallis, Ore. (civil, struc., mech., elec.) $500,000. Client, City of Corvallis, Oregon.

PENNSYLVANIA

Walter E. Spotts and Associates
Reading, Pennsylvania

¶ Construction of approximately 5000 feet of 12-in. cast iron water transmission main from reservoir to Borough of Fleetwood, Berks County, Pa. (civil) $95,000. Client, Borough of Fleetwood.

David R. Wittes
Philadelphia, Pennsylvania

¶ Recreation building, children's camp. (civil, struc., mech., elec.) $60,000. Client, Philadelphia YM-HA Camps, Inc.

H. G. Metzger, Jr. & Associates
Huntingdon Valley, Pennsylvania

¶ Survey of mechanical systems of metal processing plant, Philadelphia, Pa. (mech.) Client, Max Haupt, Consulting Engineer.

Mayer & Valentine
Cleveland, Ohio

¶ Senior-junior high school, Harbor Creek, Erie County, Pa. (mech., elec.) $1,350,000. Client, Harbor Creek Board of Education.

Southern Engineering Company
Louisville, Kentucky

¶ Greyhound terminal and parking garage, Pittsburgh, Pa. (mech., elec.) $2,225,000 (est.). Client, Arrasmith & Tyler, Arch.

Buchart Engineering Corporation
York, Pennsylvania

¶ Location study, 90 miles of Keystone Shortway LR 1009, from Ohio-Pennsylvania boundary to approximately Brookville. (civil) $109 million. Client, Department of Highways, Pennsylvania.

¶ Final design, relocation of LR 22019, 3.68 miles east of Harrisburg, Pennsylvania. (civil) $1.7 million. Client, Department of Highways, Pennsylvania.

¶ Final design, Beaver Creek Dam, Alpine, York County, Pa., including the necessary relocation of roads and design of bridge. (civil) $500,000. Client, Department of Forest & Waters, Pennsylvania.

Roushey, Smith & Uhlman
Wilkes-Barre, Pennsylvania

¶ Terminal shipping building and branch sales office. One-story, masonry, steel trusses, metal deck roof, with truck docking facilities. (civil, struc., mech., elec.) $325,000. Client, Consolidated Cigar Corp.

Sauter & Castor
Philadelphia, Pennsylvania

¶ Six 8-story dormitories, two 6-story dormitories, and dining hall. (struc.) $10,000. Client, Pennsylvania State University.

¶ Communications building. (struc.) $130,000. Client, Pennsylvania State University.

Gustav Stueber
Pittsburgh, Pennsylvania

¶ Elementary school, Chartiers Valley. (struc.) $300,000 Client, Victor Rigaumont, Arch.

SOUTH CAROLINA

J. C. Harrison
Spartanburg, South Carolina

¶ Divine Savior Hospital. (mech.) $150,000. Client, Divine Savior Hospital, York, S. C.

TENNESSEE

Schmidt Engineering Company, Inc.
Chattanooga, Tennessee

¶ Sewerage facilities. $900,000. Client, East Ridge, Tenn.

¶ Sewerage extensions to annexed areas. $300,000. Client, Chattanooga, Tenn.

Southern Engineering Company
Louisville, Kentucky

¶ Greyhound terminal, Knoxville, Tenn. (mech., elec.) $1 million

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VERSATILE ALUMINUM Lo-X combines with BullDog Plug-in-Duct, power panels, substations, Trol-E-Duct®, switchboards, safety switches and Electri-Centers® to form a coordinated distribution system that delivers power when and where you need it.

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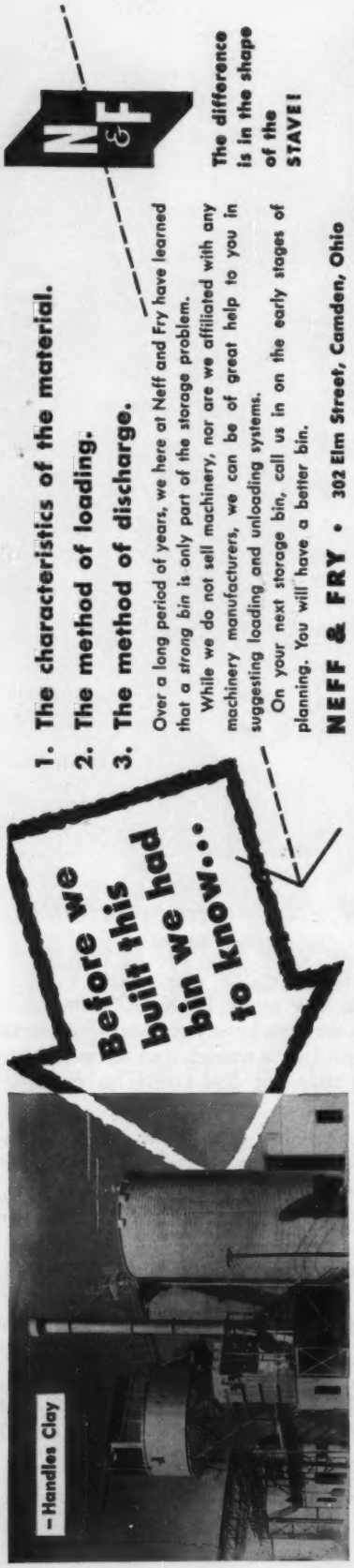
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Over a long period of years, we here at Neff and Fry have learned that a strong bin is only part of the storage problem.
While we do not sell machinery, nor are we affiliated with any machinery manufacturers, we can be of great help to you in suggesting loading and unloading systems.
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N & F
The difference is in the shape of the STAVE!
– Handles Clay

(est.). Client, Arrasmith & Tyler, Architects.

Stanley Gilbert Simm
Nashville, Tennessee
¶ Overton School, Nashville, Tenn. (elec.) $575,000 (total). Client, George D. Waller and Son, Arch.
¶ Alterations and additions to St. Thomas Hospital, Nashville, Tenn. (elec.) $1.5 million (total). Client, Woolwine, Harwood and Clark, Architects.

Buchart Engineering Corporation
York, Pennsylvania
¶ Final design, steel deck construction, 1400-ft bridge spanning Clinch River near Kingston, Tenn. (struc.) $2,350,000. Client, Department of Highways & Public Works.

TEXAS

I. A. Naman & Associates
Houston, Texas.
¶ 100-bed hospital, Wharton, Texas. Air conditioning, heating, and cooling. (mech., elec.) $1 million. Client, Reber & Davidson, Arch.
¶ Sakowitz Store, Houston, Texas. 360 tons of air conditioning, approximately 90,000 sq ft, including sales area, beauty shop, and restaurant. (mech., elec.) $1.3 million. Client, E. Werlin & C. Kiefner, Arch.
¶ Two elementary schools, Braes Timbers and Westbury area, Houston, Texas, for Houston Independent School District. Hot water heating only. (mech., elec.) $750,000. Client, H. Brown, Arch.
¶ Remodeling and additions to Cohen House, Rice Institute, Houston, Texas, 80 tons of air conditioning. (mech., elec.) $150,000. Client, Lloyd & Morgan, Arch.
¶ Lone Star Packing Co., Houston, Texas, 75 tons of refrigeration. (mech., elec.) $400,000. Client, L. Gabert, Arch.

Frank T. Drought, Consulting Engineer
San Antonio, Texas
¶ United Savings Building, 6-story, Corpus Christi, Texas. (struc., mech., elec.) $800,000. Client, Wade, Gibson & Martin, Arch.
¶ First National Bank, 10-story, Brownsville, Texas. $1 million. Client, Phelps & Dewees & Simmons.
¶ Street paving, Unit 1, Laredo, Texas. (civil) $500,000. Client, City of Laredo, Texas.
¶ Addition to airport facilities, International Airport, San Antonio, Texas. (civil) $1.5 million. Client, City of San Antonio, Texas.
¶ Woodlawn interceptor, San Antonio, Texas. (civil) $800,000. Client, City of San Antonio, Texas.
¶ 42-in. siphon, San Antonio, Texas. (civil) $570,000. Client, City of San Antonio, Texas.

Raymond L. Jenkins
Houston, Texas
¶ Methodist Hospital addition. (struc. $500,000, mech. $2 million) Client, Milton McGinty, Arch.

Bridgers and Paxton
Albuquerque, New Mexico
¶ Shopping center, Midland, Texas. (mech.) $1.5 million. Client, Gordon McCutchan, Arch.

Harland Bartholomew and Associates
St. Louis, Missouri
¶ Feasibility study of an urban renewal program of Baylor area (640 acres). Client, City of Waco, Texas.
¶ Final urban renewal plans (258 acres). Client, City of Corpus Christi, Texas.

Fuad S. Maayeh
Dallas, Texas
¶ First Baptist Church of Arlington, Texas. (struc.) $330,000. Client, Leinbach Brothers, Arch.
¶ Lone Star Company office building, Dallas, Texas. (struc.) $260,000. Client, Cerf Ross & Associates, Architects.

Freese, Nichols & Turner
Houston, Texas
¶ Water and sewer improvements including sewage treatment plant, sewage lift station, and interceptor sewer. (civil, struc., mech., elec.) $1,150,000. Client, City of Freeport, Texas.
¶ Sewer system improvements including sewage treatment plant, sewage lift station, and interceptor sewer. (struc., mech., elec.) $900,000. Client, City of Harlingen.

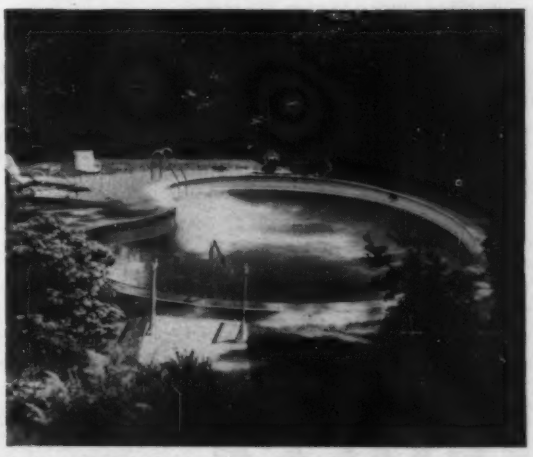
Forrest & Cotton
Dallas, Texas
¶ Feasibility report for dam and reservoir to be located on Sabine

LOW COST STEEL PIPE HELPS PUT SWIMMING INTO YOUR BACK YARD!

Home swimming pools, once an unaffordable luxury for most families, are now available at prices within the reach of many, thanks to new, cheaper construction methods and inexpensive materials such as *steel pipe*.

In the 30,000 back yard pools that will be installed this year, reliable *steel pipe* will be used variously for supply and drainage lines, ladders, filtration systems, diving board supports . . . yes, even to radiantly heat the water if desired!

Steel pipe because it is the least expensive and most versatile of metal tubular products, contributes to the economic availability of so many good things in life. Yes, *steel pipe* is the most widely used pipe in the world for radiant heating, snow melting, fire sprinkler systems, vent and drainage lines, electrical conduit, structural uses, refrigeration, gas, oil and water lines.



Pools like this and the one above are within the financial reach of many 2-car families and low-cost *steel pipe* helps to make this true.

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- Low cost with durability
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- Weldable—easily, strongly
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1856 10th St., OAKLAND 23, CALIFORNIA

River at Toledo Bend. $40 million. Client, Sabine River Authority of Texas and Louisiana.

¶ Blackburn crossing dam and reservoir, Neches River, Texas. $6.5 million. Client, Upper Neches Municipal Water Authority.

¶ City of Dallas 50 mgd East Side Water Treatment plant. $5.5 million. Client, City of Dallas, Texas.

¶ Repair of aircraft parking apron, NAS Corpus Christi, Texas. $190,000. Client, U. S. Navy.

¶ Additional aviation fuel storage, NAS Dallas, Texas. $165,000. Client, U. S. Navy.

¶ Plans and specifications for additions to water system. $142,000. Client, City of Richardson, Texas.

¶ Plans and specifications for additions to water distribution system. $100,000 (est.). Client, Ellis County Water and Improvement District No. 1, Waxahachie, Texas.

¶ Plans and specifications for 750,000 gallon elevated tank. $160,000 (est.). Client, Ellis County Water and Improvement District No. 1, Waxahachie, Texas.

UTAH

Henningson, Durham & Richardson
Colorado Springs, Colorado

¶ Comprehensive report on sewage treatment, sanitary sewers, and waterworks. (civil) $200,000. Client, City of Blanding, Utah.

VERMONT

Henry J. Campbell, Jr., P.E.
Mineola, New York

¶ Church and sunday school, Second Congregational Church, Bennington, Vt. (mech., elec.) $150,000. Client, Engineers, Raymond & Rado.

VIRGINIA

Joseph P. Kelly & Associates
Washington, D.C.

¶ South Gate Motel, Arlington, Va. (mech., elec.) $230,000. Client, John Wright, Owner-Builder.

E. Barrett Foster
Sheffield, Alabama

¶ Underground electrical distribution system for Bristol, Virginia Utilities Board, Bristol, Va., consisting of 13.2 kv primary, 216Y/125 v secondary network system, with three-phase 500-kva network transformers and network protectors. (elec.) $450,000. Client, Bristol, Virginia Utilities Board.

WASHINGTON

Cornell, Howland, Hayes & Merryfield
Boise, Idaho

¶ Survey and design of approximately 2½ miles of city streets, Pasco, Wash. (civil, struc., mech., elec.) $200,000. Client, City of Pasco.

R. W. Beck and Associates
Seattle, Washington

¶ Water line suspension tower across Skagit River. (civil, struc.) $200,000. Client, Public Utility District No. 1, Skagit County, Wash.

¶ Modernization of Air Force hangers 3 and 4. (struc., mech., elec.) $160,000. Client, McChord Air Force Base, Washington.

¶ Storm drainage program. (civil) $2.5 million. Client, City of Bellevue, Wash.

WYOMING

Miner and Miner, Consulting Engineers, Inc.
Greeley, Colorado

¶ Design of 120-mile rural telephone system near Hamilton Dome, Wyo. $130,000. Client, Tri County Telephone Association, Basin, Wyo.

¶ Long range system planning report. $4,920,000. Client, Rural Electric Co., Pine Bluffs, Wyo.

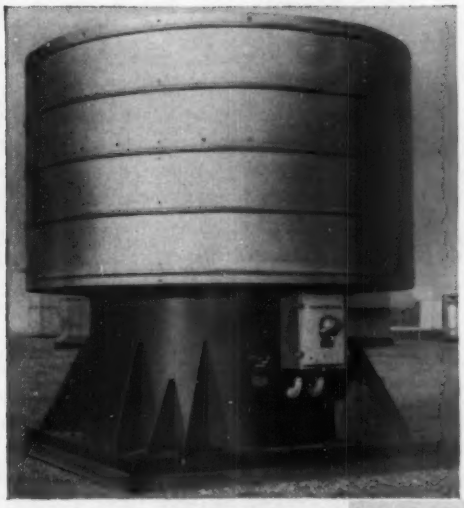
Robert L. Streeter
Casper, Wyoming

¶ Water supply facilities, development of 12 mgd of additional water supply and miscellaneous work in connection with project. $550,000. Client, Board of Public Utilities, City of Casper, Wyo.

FOREIGN

Fred S. Dubin Associates
Hartford, Connecticut

¶ American Embassy, Helsinki, Finland. (heating, ventilating, plumbing, electrical, air conditioning) $1,250,000. Client, Harwell Hamilton Harris, Arch. ▲▲



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Books

For the Libraries of Consulting Engineers

CENTRIFUGAL AND AXIAL FLOW PUMPS, 2nd Edition, by A. J. Stepanoff; John Wiley & Sons, Inc.; 462 pp.; $12.00.

Reviewed by
Igor J. Karassik,
Consulting Engineer and
Assistant to Vice President,
Harrison Div., Worthington Corp.

This is the second edition of a volume which first appeared in 1948, which has been revised and expanded to include much progress which has taken place in this field during the last ten years. Among other new material, there has been added a chapter on "Water-Hammer Problems in Centrifugal Pump Systems" which will be of special interest to consulting engineers.

While the subdivision into theoretical and practical areas is not too readily apparent, the book does offer variable interest to the average consulting engineer. The chapters on centrifugal pump theory, the design of impellers and casings, and the determination of various pump losses is directed more to the pump designer than to the user or consulting engineer. On the other hand, the book treats in great detail a number of problems that frequently are encountered by the consulting engineer. Of special interest will be Chapters 12, Cavitation in Centrifugal Pumps; 13, Special Operating Conditions; 14, 16, and 17 dealing with Special Problems on Pump Design and Application; and 19 on Water-Hammer.

It would be difficult to single out any particular area in these chapters that could be recommended above the others. All of the information is presented clearly and adequately, permitting the consulting engineer to acquaint himself with numerous problems on which he normally cannot consider himself an expert. To mention but a few examples, I refer the reader to Chapter 13, which discusses operating conditions of centrifugal pumps beyond their normal head-capacity and speed range. The author provides readily usable information on operation of a pump as a hydraulic turbine (with reverse flow and reverse rotation), behavior of a pump in the event of power failure, and starting a pump already running in reverse. Some of these special operating conditions are unavoidable while others occur accidentally, and knowledge of possible protective means is an absolute necessity to the consultant.

While numerous text and reference books exist on the subject of water-hammer, they generally delve into this subject well beyond the normal needs of a user of centrifugal pumps. The information contained in this book, as a result, will suffice to solve most commonly encountered problems. When it does not, the case usually will require the services of an expert and a book is to no avail.

The book could have gained from a more thorough and more diversified presentation of the various types of pumps encountered in industry. Chapter 17 is limited to hot-oil pumps, boiler feed pumps, boiler circulating service, submersible pumps, pipeline pumps, and a single example of a self-priming pump. This last subject in itself could have provided material for an entire chapter. But it must be concluded that the book was intended primarily for beginning designers and possibly as a text for university level courses. Its usefulness to consulting engineers is nevertheless very real.

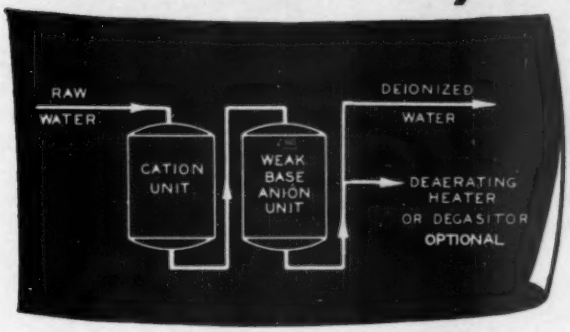
•

NETWORK SYNTHESIS, Vol. 1, by David F. Tuttle, Jr.; John Wiley & Sons, Inc.; 1,175 pp.; $23.50.

Reviewed by
A. E. Fitzgerald
Jackson & Moreland Inc.

This book is the first volume of a projected two-volume series on the design of linear, passive, electric networks which are to behave

The modern way to solve water problems



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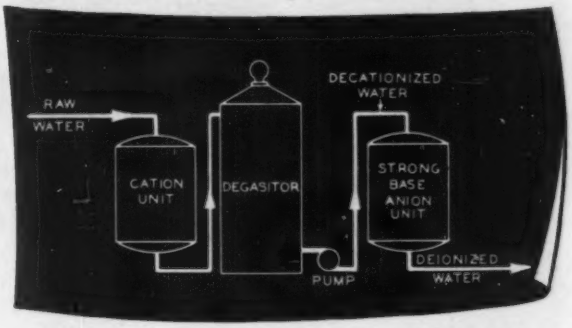
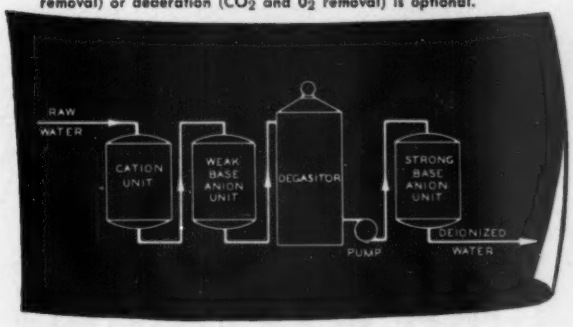
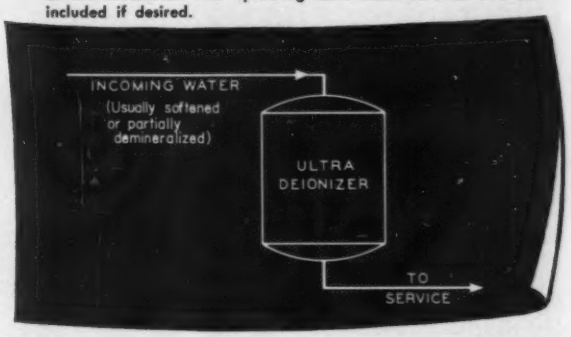


Delivers high quality mineral-free water and eliminates CO_2 at low investment and operating cost. Silica removal can be included if desired.



Used where water high in quality and free of CO_2 and silica is desired. A most economical system for high-bicarbonate waters.



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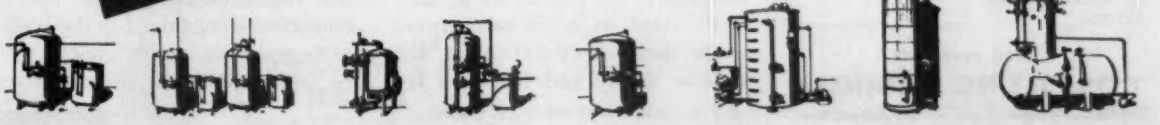

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in a prescribed manner as a function of frequency. The present volume deals only with two-terminal networks. Volume II will deal with the more important four-terminal networks.

The book is primarily a text for graduate courses in network theory and stems from Professor Tuttle's work in that field at MIT, Bell Laboratories, and Stanford. Basically, it is a comprehensive presentation of the classical and modern synthesis methods, a presentation which is highly organized and skillfully coordinated. As the author continually reminds us, the organization of the entire volume is built around three elements essential to the general procedure: (1) knowledge of the properties of networks; (2) approximation methods when the desired behavior is not fully obtainable; and (3) the realization of networks compatible with (1) and (2).

The treatment of approximations is a particular feature. The book will appeal principally to theoretically and mathematically minded readers, and such readers will have no difficulty with background. Only elementary circuit theory and undergraduate mathematics are necessary.

The author's solicitude for the reader's intellectual well-being while making his way through the book and attempting to retain proper perspective is unusual in technical writing. In the usual paper of a mathematical nature appearing in technical journals and transactions, the reader himself is forced to insert the half of the treatment which the author could not cram into the space allowed — and it frequently helps to skim the paper backwards before reading it from the beginning. This book is almost at the opposite extreme. The danger here, as the author points out twice in his preface, is inability to see the forest because of the trees. As might be expected under these circumstances, the style is wordy and the pace leisurely. Many technical writers who have labored under rigid space limitations may be interested in evaluating the gain in readability and understandability made here by ignoring such restrictions.

To summarize, the book is a helpful addition to the extensive literature on network and circuit theory. In the consulting field, however, it will be of direct value only to those engaged in the design and specification of projects involving circuitry for communication and control applications.

•

PROCESS INSTRUMENTS AND CONTROLS HANDBOOK, edited by Douglas M. Considine; McGraw-Hill Book Co., Inc.; 1383 pp.; $19.50.

Reviewed by
Loren E. Bollinger
The Ohio State University

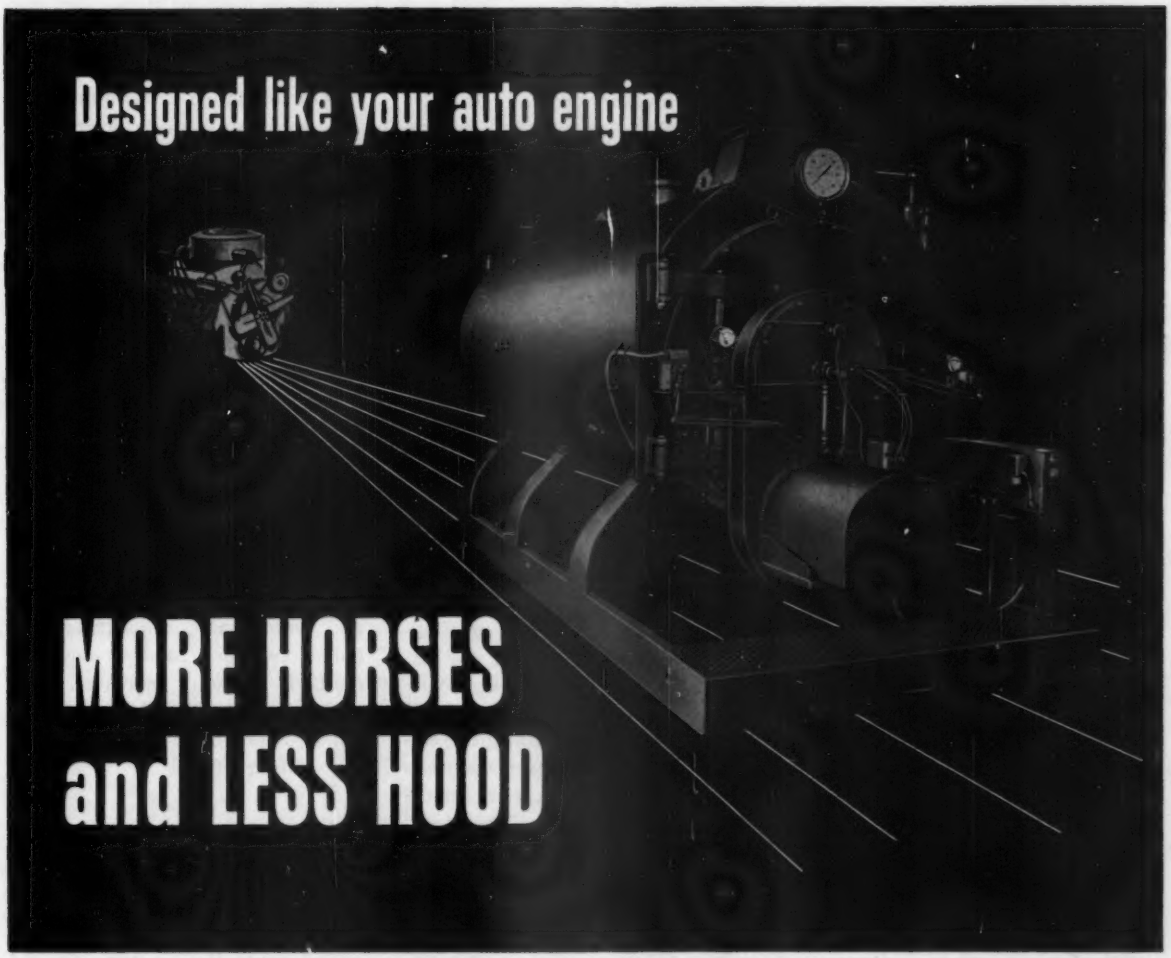
Consulting engineers concerned with instrumentation and with automatic controls will find this handbook an invaluable addition to their active reference library.

For the first time, engineers will find that operating and design fundamentals of measurement and automatic control systems used in the process fields are covered in sufficient detail in a single volume.

More than 70 authors contributed to the 13 principal sections of the book. The handbook is slanted towards the process industries but engineers in research laboratories and those engaged in medical, military, and aircraft instrumentation will find the well organized information to be most useful.

A large proportion of the section space has been used to describe the newer and lesser known instruments and methods. A comprehensive survey of strain gages, other electrical pressure transducers, and industrial weighing equipment is included. Moisture-measuring systems are discussed, and an extensive digest of photometric instrumentation is contained in the book.

Engineers in quality control will be interested in the discussion on



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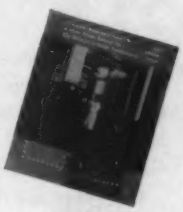
- A worldwide service organization



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rheological instrumentation with emphasis on viscosity and consistency measurements. Techniques for direct process stream control are stressed. A removable table is included which describes over 100 separate instrumental techniques together with appropriate selection criteria. Even spectrometry is depicted in appreciable depth.

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•

THE STRUCTURES OF EDUARDO TORROJA: An Autobiography of Engineering Accomplishment, by E. Torroja; F. W. Dodge Corp., New York; 209 pp.; $8.50.

The famous Spanish architect-engineer Eduardo Torroja discusses in this book 30 of his most important structures. Among the structures he analyzes are bridges, churches, viaducts, stadia, water towers, factories, and dams. Many are of reinforced concrete.

Over 275 illustrations amplify the text and show construction details, models, and a number of projects under construction.

•

AIDS TO EFFICIENT MACHINE DESIGN IN WELDED STEEL, compiled by The Lincoln Electric Company, Cleveland, Ohio; 96 pp.; $1.00.

This comprehensive and completely illustrated manual is for the machine designer who wishes to apply the techniques of welded steel design. Much of the material in the handbook is original. All of the information, however, is practical rather than theoretical and has been tested in use on a wide variety of machines.

Chapters are devoted to redesign of cast bases and flywheels for minimum costs; methods of appraisal of steel design for minimum cost; how to use steel efficiently for bending loads, to resist torsion, and to minimize vibration; and how to design welds efficiently for strength.

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APPLIED MATHEMATICS FOR ENGINEERS AND PHYSICISTS, second edition, by Louis A. Pipes; McGraw-Hill Book Co.; 723 pp.; $8.75.

This newly revised book gives the engineer the principal mathematical techniques he needs to analyze practical problems and covers those subjects essential for the understanding of present-day engineering analysis.

Discussed in detail are infinite series, complex numbers and the complex transform theory, vector and tensor analysis, partial differential equations, modern algebraic methods including matrices, integral equations, the calculus of variations, and ordinary nonlinear differential equations.

•

Creativity, a subject once considered of interest only in the arts, has become important to executives, engineers, and scientists. A useful guide to this field has just been published entitled "Creativity — A Comprehensive Bibliography on Creativity in Engineering, Science, Business and the Arts."

This 16-page booklet contains over 600 references to books and articles which deal with such subjects as: the creative process, research techniques, creative teamwork, identifying creative individuals, problem solving, organizational climate, and motivational factors.

The book was prepared by Deutsch and Shea, Inc., and is published by Industrial Relations News, 230 West 41st St., New York 36, N. Y. The price is $2.00.

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Almost any business larger than a "one-man" organization needs a clearly defined organizational set-up to achieve success, according to

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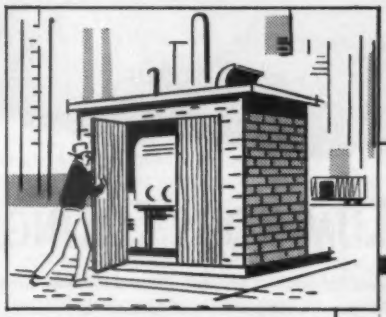
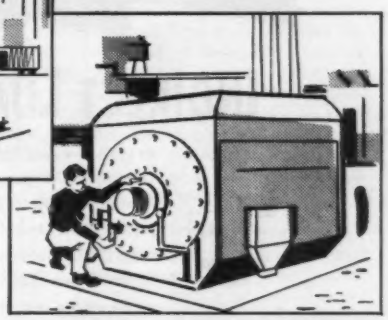
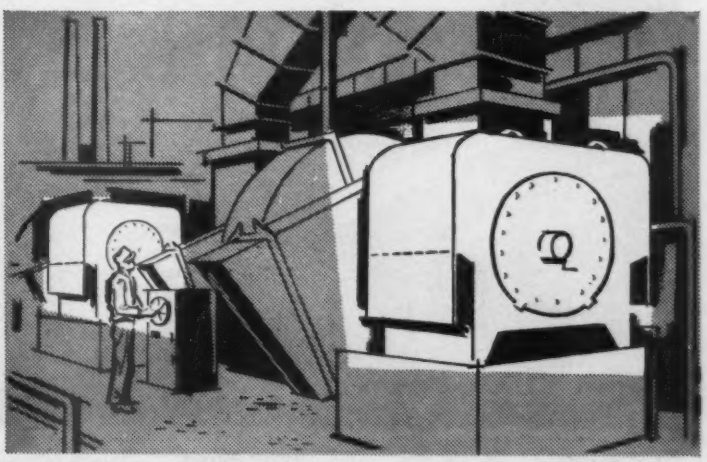


Initially, motors were sheltered in buildings . . .



Later, motor enclosures themselves sealed out surrounding atmosphere



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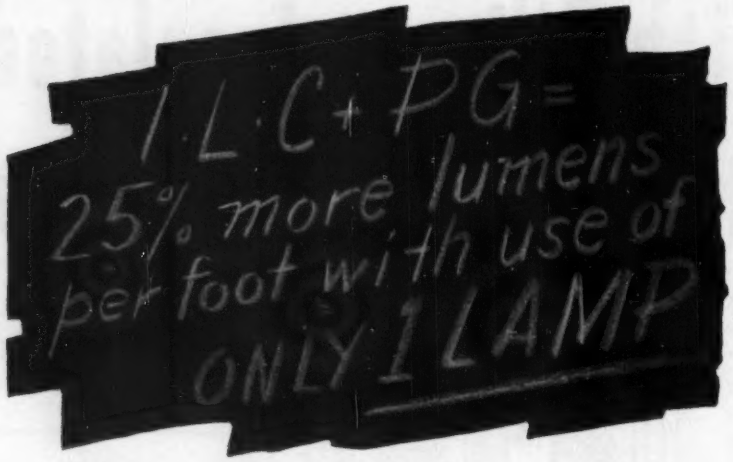

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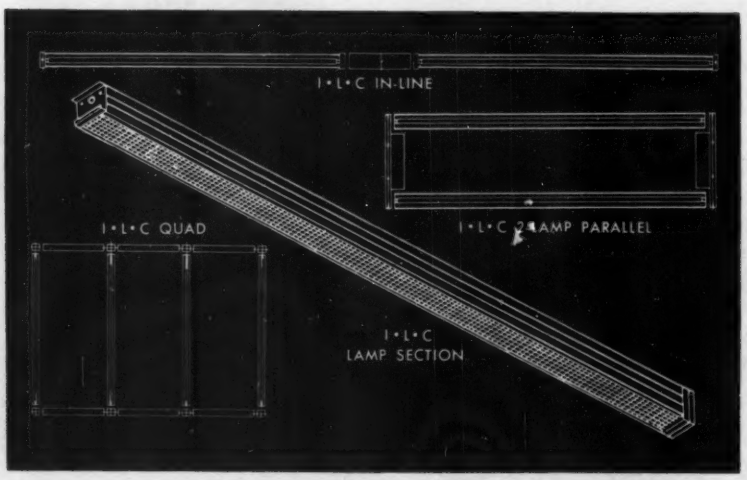

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a new leaflet just issued by the Small Business Administration.

The leaflet explains that organization is the executive structure of a business and the interrelationship of its members. Examples illustrate small business failures resulting from faulty organization.

A checklist to determine conditions in a small business is included, as well as a bibliography for further information.

"Rating Your Firm's Organization" is number 93 in the Small Business Administration's series of Management Aids and can be obtained upon request from the Small Business Administration, Lafayette Building, Washington, D. C.

Other leaflets issued by the Small Business Administration discussing management subjects, and which also are available upon request, are: number 76, "Surveying and Controlling Executive Time," and number 87, "Traps to Avoid in Small Business Management."

•

Street lighting, from colonial times to the present day, is presented pictorially in a new color movie now available from the film library of Aluminum Company of America.

Historically accurate, the 16 mm, 20-minute motion picture features many scenes taken in Philadelphia, one of the leading metropolitan users of aluminum lighting items.

Combining technical and economical features of modern lighting with aluminum, the film highlights the value and effects of good lighting in achieving safety, crime prevention, and beautification.

The production of lighting standards is pictured from the extrusion process to final tapering, wrapping, and erection.

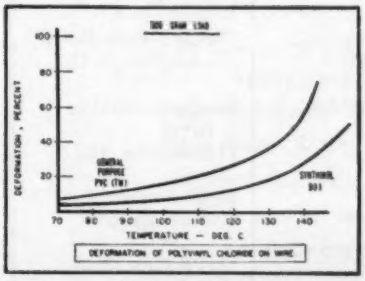
Suitable for screening before street and highway engineers, and traffic and transportation safety committees the film may be borrowed by writing Motion Picture Section, Aluminum Company of America, Alcoa Building, Pittsburgh 19, Pa. ▲▲

An unusual polyvinyl chloride compound

CURRENT TRENDS

No. 10 in a series of articles

Polyvinyl chloride (PVC) compounds have been widely used in the wire and cable industry. These compounds have many useful properties and have found wide application as insulations and sheaths. These properties and applications were discussed in Current Trends No. 4, entitled "Progress Report on Polyvinyl Chloride Insulations." Like most materials, the conventional PVC compounds have limitations, and there are many applications where these weaknesses have prevented taking full advantage of the good features. This discussion is about a special PVC compound, which was designed and developed in an effort to incorporate into a single compound as many desirable properties as possible. Known as Synthinol 901, this compound was developed in the laboratories of the Rome Cable Corporation, Rome, New York. Today Synthinol 901 is being used as insulation and sheath for wires and cables in many applications where conditions of installation or use require properties not to be found in conventional PVC compounds.



Graph shows heat deformation vs. temperature, and compares Synthinol 901 with conventional Type TW compounds. Test run in accordance with Underwriters' Laboratories standard procedure, except for temperature.

Shortly after World War II, the Underwriters' Laboratories established the need for a PVC insulated wire suitable for wiring appliances where an operating temperature rating of 105 C was required. Rome Cable laboratory attacked the problem of developing a PVC compound to meet U/L requirements. The laboratory was also given a list of desired additional properties for incorporation into this compound. This project assignment was completed in 1949, at which time Rome Cable introduced Synthinol 901. Since 1949 this compound has provided the solution to a rather impressive list of tough wiring problems.

True, there are many 105 C PVC compounds available today; there are likewise compounds available which possess one or more of the individual properties on the list describing Synthinol 901. What is unusual is that here, for the first time, was a single PVC compound which possessed all of these superior properties and which also retained all of the properties found in conventional PVC materials.

Rather than presenting data and charts, it is believed that the practical value of this compound is better illustrated by relating a few of the concrete results of eight years of continuous work with users who have had difficult problems. These case histories are all a matter of record.

1. Oil refinery, industrial and chemical plant wiring.

Plant and oil refinery engineers had long used Type TW for plant wiring. Results were good, but too often the heat deformation characteristics of conventional TW caused trouble in warm locations. Since one of the outstanding properties of Synthinol 901 was its superior resistance to deformation, this material was tried, and soon became widely used because of its much better record in service. During several years of experience Synthinol 901 proved to have chemical and solvent resistance so superior to conventional materials that it came into wide use where this resistance was needed. In these industrial applications, which are not under the jurisdiction of the National Electrical Code, the higher temperature ratings have made possible appreciably higher current carrying capacities, with consequent savings.

In chemical plant wiring the corrosive action of chemicals and solvents has always been a tough problem. Although PVC has inherently better resistance to chemicals and solvents than many other materials, engineers desired further improvement. One user ran a series of long time tests with samples immersed in various solvents, acids, and alkalis. The results clearly showed that Synthinol 901 would give longer life than other PVC compounds, when exposed to these chemicals.

2. Oil-filled transformers.

Transformer engineers have long been searching for a cable construction to replace the varnished cambric-insulated cable used for high voltage and tap changer leads in oil-filled transformers. One transformer manufacturer, encouraged by successful experience with Synthinol 901 in other applications, began a comprehensive study of this insulation in lieu of VC on these high voltage leads. In operation these leads are immersed in the transformer oil at elevated temperatures. This test program extended over several years, and included evaluation of almost every conceivable effect of Synthinol 901 on the life and performance of the transformer. These engineers came up with the following reasons for standardizing on Synthinol 901 for this application:

1. There was less sludge in the oil than when VC insulation was used.
2. There was no harmful degradation of electrical properties of the oil.
3. Conductors ran cooler when insulated with Synthinol 901, permitting a 7% increase in current rating of the lead cables.
4. The use of Synthinol 901 in lieu of VC afforded substantial dollar savings.

3. Coil Leads.

Many manufacturers of small coils for use in electrical and electronic components had tried for years to use PVC insulated lead wires in their manufacturing operations. These coils, with leads attached, are put through a varnish or wax impregnation followed by a baking cycle. The baking cycles may be as long as 16 hours at temperatures as high as 105 C. In a great many of these cases PVC insulated lead wires had given trouble due to shrinkage, cracking, and stiffening during the impregnation and subsequent baking. Here is an application where Synthinol 901 has been doing an almost faultless job. After nearly eight years of wide usage, there has been no case of shrinkage, cracking, or stiffening of insulation reported where Synthinol 901 has been used in this application.

4. Panelboard wiring.

For many years panelboards and switchboards have been wired with Type TA wire. This wire has a layer of asbestos over a primary insulation of PVC. The asbestos has been used as a protection against the heat deformation which was known to occur at sharp bends and points where wiring was held under clamps. Transformer and machine tool manufacturers have found that the superior resistance of Synthinol 901 makes the asbestos covering unnecessary. In this application, for additional safety, the insulation thickness is normally 1/64" heavier than standard. These manufacturers have found Synthinol 901 to be an economical solution to their particular needs.

These case histories are only a few of the applications where this unusual compound has served well. Synthinol 901 has been proven by test and actual use to be superior to conventional PVC compounds in the following ways:

1. Suitable for continuous operation at higher temperatures.
2. More stable under severe heat cycling.
3. Suitable for continuous immersion in hot transformer oil.
4. Superior resistance to chemicals and solvents.
5. Greater resistance to heat deformation.

All of our experience and knowledge in this field is available to you. If you have a wire and cable problem where you think Synthinol 901 might prove useful, why not let us help you?

ROME CABLE CORPORATION, Rome, New York

Consulting Engineers' Calendar

Date	Sponsor	Event	Location
July 8-11	Institute of the Aeronautical Sciences	National Summer Meeting	Ambassador Hotel Los Angeles, Calif.
Aug. 11-14	Society of Automotive Engineers	National Meeting	Ambassador Hotel Los Angeles, Calif.
Aug. 17-22	Illuminating Engineering Society	National Technical Conference	Royal York Hotel Toronto, Canada
Aug. 18-21	American Institute of Chemical Engineers and American Society of Mechanical Engineers	Heat Transfer Conference	Edgewater Beach Hotel Chicago, Ill.
Aug. 19-22	American Institute of Electrical Engineers	Pacific General Meeting	Hotel Senator Sacramento, Calif.
Sept. 15-20	Engineers Joint Council	International Congress on Large Dams	The Statler Hilton New York, N.Y.
Sept. 15-19	Instrument Society of America	Instrument-Automation Conference	Convention Hall Philadelphia, Pa.
Sept. 17-18	Building Research Institute	Conference on Floor Construction Systems	Sheraton-Park Hotel Washington, D. C.
Sept. 22-24	Standards Engineers Society	Seventh Annual Meeting	Benjamin Franklin Hotel Philadelphia, Pa.
Sept. 28-Oct. 1	American Society of Mechanical Engineers	Power Conference	Hotel Statler Boston, Mass.
Sept. 29-Oct. 3	American Society of Tool Engineers	Semiannual Meeting	Shrine Exposition Hall Los Angeles, Calif.
Oct. 6-8	National Association of Corrosion Engineers	Salt Water Corrosion Conference	Hotel Somerset Boston, Mass.
Oct. 13-17	American Society of Civil Engineers	Annual Convention	Hotel Statler New York, N. Y.
Nov. 17-20	American Institute of Electrical Engineers	Conference on Magnetism and Magnetic Materials	Sheraton Hotel Philadelphia, Pa.

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The building is owned by the Empire State Building Corporation. Consulting Engineer for the Marlo units was The Firm of Edward E. Ashley, and among air conditioning contractors are: Kennedy-Scheidel & Young
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Almirall & Co., Inc.
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Aerofin Corp. 142
Aget Mfg. Co. 78
Allis-Chalmers
Industrial Equipment Div. 49
Aluminum Co. of America 131
American Blower
Div. of American-Standard 6
American Engineering Co. 77
American Vitrified Products Co. 183
AMP Inc. 20
Anaconda Wire & Cable Co. 106-107
Appleton Electric Co. 47
Armstrong Machine Works 159
Automatic Switch Co. 79

Baldwin-Hill Co. 53
Baltimore & Ohio Railroad 67
Barco Manufacturing Co. 16
Bell & Gossett Co. 141
Bituminous Coal Institute 184-185
Black, Sivalls & Bryson, Inc.
Safety Head-Vent Valve Div. 22
Borden Metal Products Co. 33
Bros. Inc., Power Div. 42-43
Buffalo Forge Co. 197
BullDog Electric Products Co. 193
Bussmann Mfg. Div.
McGraw-Edison 72-73
Butler Mfg. Co.
Buildings Div. 189
Byers Co., A. M. 28-29
BYRNE Doors, Inc. 139

Carrier Corp. 187
Ceilcote Co. Inc., The 48
Chapman Valve Mfg. Co., The 178-179
Clarage Fan Co. 45
Cochrane Corp. ..... Fourth Cover
COLT Ventilation of America, Inc. 38
Committee on Steel Pipe Research 195
Conco Engineering Works 52
Connor Engineering Corp. 143
Corning Glass Works 112
Curtis Mfg. Co. 210
Cyclotherm Div.
National-U.S. Radiator Corp. 201

Dearborn Chemical Co. 206
DeLaval Steam Turbine Co. 135
Dow Corning Corp. 203
Dracco Corp. 191
Dunham-Bush, Inc. 39

Earle Gear & Machine Co., The 158
Edward Valves, Inc.
Sub. of Rockwell Mfg. Co. 62-63
Electro Silv-A-King Corp. 69
Elgin Softener Corp. 199
Erico Products, Inc. 58

Foster Engineering Co. 154
Fuller Co. 177

Gallaher Co., The 11
General Electric
Specialty Transformer Dept. 144-145
General Filter Co. 56
Goulds Pumps, Inc. 17
Graver Tank & Mfg. Co., Inc. 35, 36
Graver Water Conditioning Co. 4
Gustin-Bacon Mfg. Co. 133

Hamilton Kent Mfg. Co. 78
Heinemann Electric Co. 50
Hendrick Mfg. Co. 192
Hotel Pittsburgher 80
Hotel Wolverine 198
Hubbell, Inc., Harvey 156

Insul-8-Corp. 14
International Boiler Works Co., The 60
Intrusion-Prepakt, Inc. 209
Iron Fireman Mfg. Co. 147
Irving Subway Grating Co., Inc. 196
I-T-E Circuit Breaker Co.
Switchgear Div. 12-13

Jeffrey Mfg. Co. 114-115
Jenn-Air Products Co., Inc. 19
Jerguson Gage & Valve Co. 66
Johnson-March 54
Jordan Corp.
Industrial Sales Div. of OPW Corp. 180

Keasbey & Mattison Co. 157
Kerite Co. 117
Kohler Co. 152
Kraloy Plastic Pipe Co. 162
Kramer Trenton Co. 105

Leffel & Co., The James 155

Mahon Co., The R. C. 24-25
Marlo Coil Co. 207
Master Builders Co., The ..... Third Cover
Mercoid Corp., The 190
Merrick Scale Mfg. Co. 76
Mesta Machine Co. 149
Minneapolis-Honeywell Reg. Co. 167-168-169-170-171-172-173-174-175-176

National Aluminate Corp. 18
Naylor Pipe Co. 59
Neff & Fry Co., The 194

Onan & Sons Inc., D. W. 188

Peerless Electric Co., The
Fan & Blower Div. 151
Peerless Pumps Div.
Food Machinery & Chemical Corp. 61
Petrometer Corp. 10
Pittsburgh Piping & Equipment Co. 75
Powell Co., The William ..... Second Cover
Prat-Daniel Corp.
Power Div. 134
Propellair
Div. of Robbins & Myers, Inc. 140
Pyle-National Co., The 55

Ray Burner Co. 161
Richmond Engineering Co., Inc. 166
Ric-wiL, Inc. 3
Rockwell Standard Corp.
Grating Div. 182
Roebling's Sons Corp., John A. 21
Rome Cable Corp. 205
Ross Heat Exchanger
Div. of American-Standard 125

S & C Electric Co. 181
Sika Chemical Corp. 70
Silvray Lighting Inc. 204
Sims Co., Inc., The 124
Spencer Turbine Co., The 46
Square D Co. 136-137
Standard Transformer Co. 40
Stran-Steel Corp. 126
Sun Chemical Corp.
A. C. Horn Co. 76, 80
Superior Combustion Industries Inc. 51
Sutorbilt Corp.
Sub. of Fuller Co. 9

Tapecoat Co., The 186
Terry Steam Turbine Co., The 57
Thermal Engineering Corp. 148
Tranter Mfg. Inc. 65
Tube Turns Plastics, Inc. 41

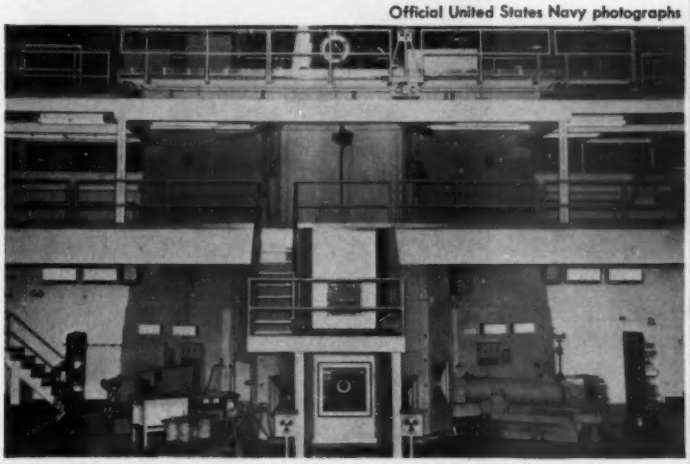
Viking Pump Co. 160

Warren Webster & Co. 23
Webster Engineering Co., The 15
Weighing & Control Components, Inc. 68
Westinghouse Electric Corp.
Standard Control Div. 119-120-121, 164-165
Sturtevant Div. 113
White Diesel Engine Div.
The White Motor Co. 71
Whiting Corp. 153
Wing Mfg. Co., L. J. 30-31
W-K-M
A Div. of ACF Ind., Inc. 7

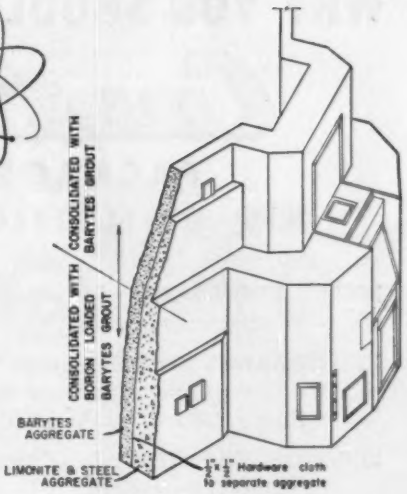
Yarnall-Waring Co. 81
York Corp. 163

unique Prepakt wall shields nuclear research at Naval Laboratory

Official United States Navy photographs



Prepakt high-density concrete shield forms one end of Naval Research Laboratory "swimming pool" reactor. Behind shield reactor core is immersed in pool 40 ft. by 26 ft., 20½ ft. deep. Besides assuring safety from harmful radiation, Prepakt methods eliminated water leakage problems usually associated with difficult placement of conventional concrete.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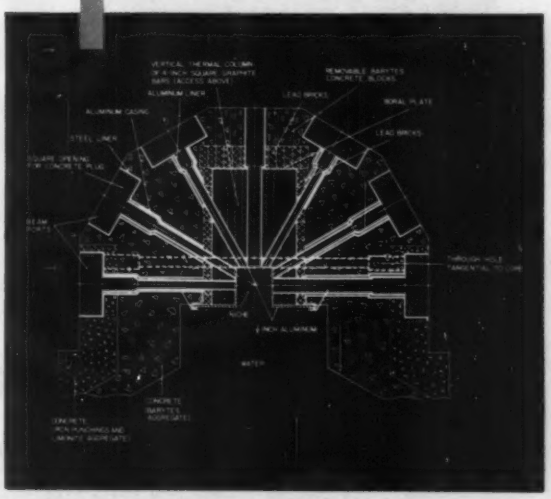
CONSOLIDATED WITH BORON LOADED BARYTES GROUT
BARYTES AGGREGATE
LIMONITE & STEEL AGGREGATE
½" x ½" Hardware cloth to separate aggregate

Prepakt concrete is made by consolidating preplaced aggregates with special grouts. For this concrete shield the aggregate nearest the core was barytes, for absorbing neutrons. Directly behind, a ½-inch mesh screen separates the barytes from a blended coarse aggregate consisting of limonite and steel punchings. This section was to stop gamma rays. All aggregates were precisely preplaced, then intruded simultaneously with a grout containing boron frits and barytes sand. When the grout level reached an elevation where less shielding was needed, the expensive boron frits was withdrawn from the mix and a straight barite grout used to complete the placement.

The Naval Research Laboratory Reactor in Washington, D. C. features one of the most unusual concrete biological shields ever constructed. According to specifications, the shield was to be composed of four different mixes of high-density concrete cast monolithically without cold joints. The complexity of mix design and the necessity for precise, uniform placement made it advisable to call in shielding concrete specialists. INTRUSION-PREPAKT was selected because its experience and unique methods were ideally suited to the project.

Safety, economy and operational effectiveness were all considered in designing this shield. It was desirable that it be as thin as possible to hold the length of beam ports to a minimum and thus intensify the neutron flux at the ports' outer ends. At the same time the shield must be dense and leak-free to assure personnel of complete safety. PREPAKT* high-density concrete provided the economical solution and met all conditions with an ease and sureness that goes hand-in-hand with experience.

Patented methods and materials in the hands of skilled personnel permit INTRUSION-PREPAKT to take jobs like this in stride. Tight schedules and difficult operating conditions are the rule rather than the exception. Whether your requirements are for high-density concrete or more conventional construction services, you will save time and money by calling INTRUSION-PREPAKT, INC., Room 568-0, Union Commerce Bldg., Cleveland 14, Ohio. European Division, Zurbaran 14, Madrid, Spain. In Canada, INTRUSION-PREPAKT, LTD., 159 Bay Street, Toronto, Ontario.



Horizontal cross section through Prepakt shield illustrates necessity for using concrete that assures complete embedment of beam ports and a tight bond to metal inserts.

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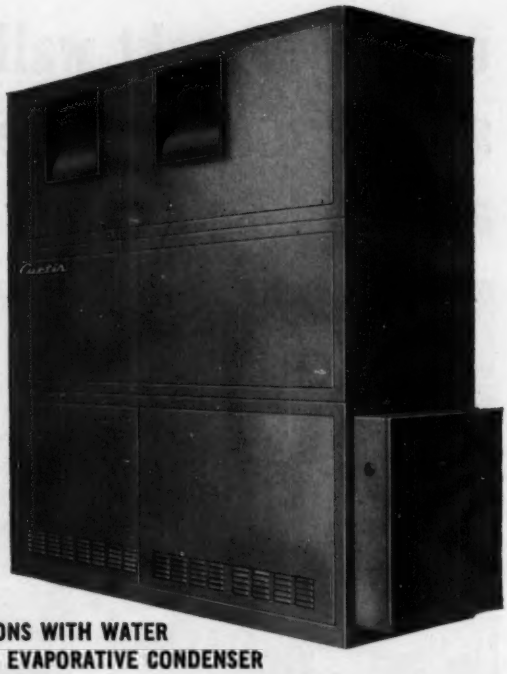

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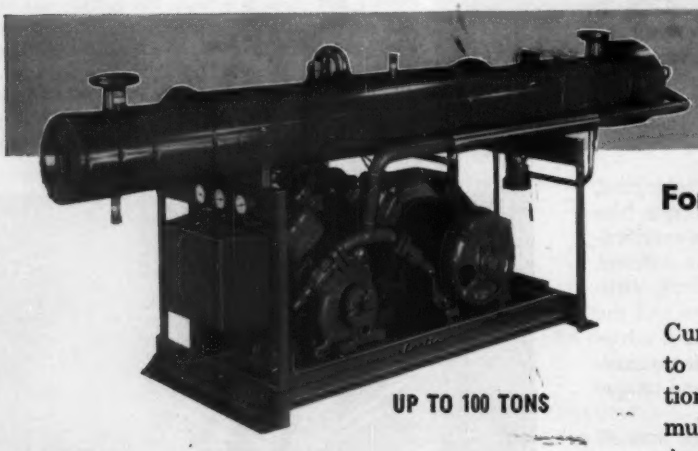

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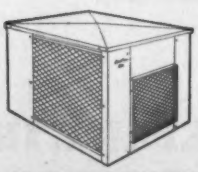

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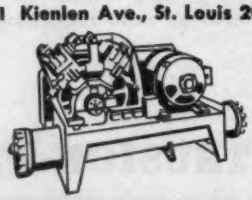

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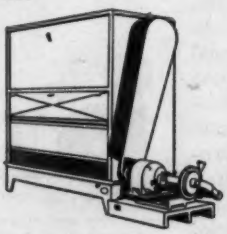

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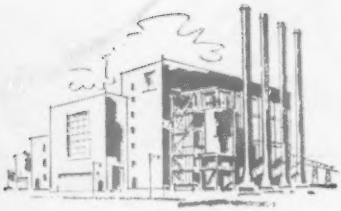

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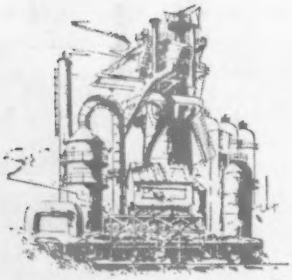

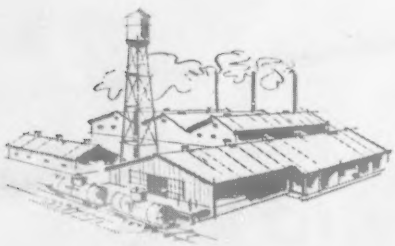

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